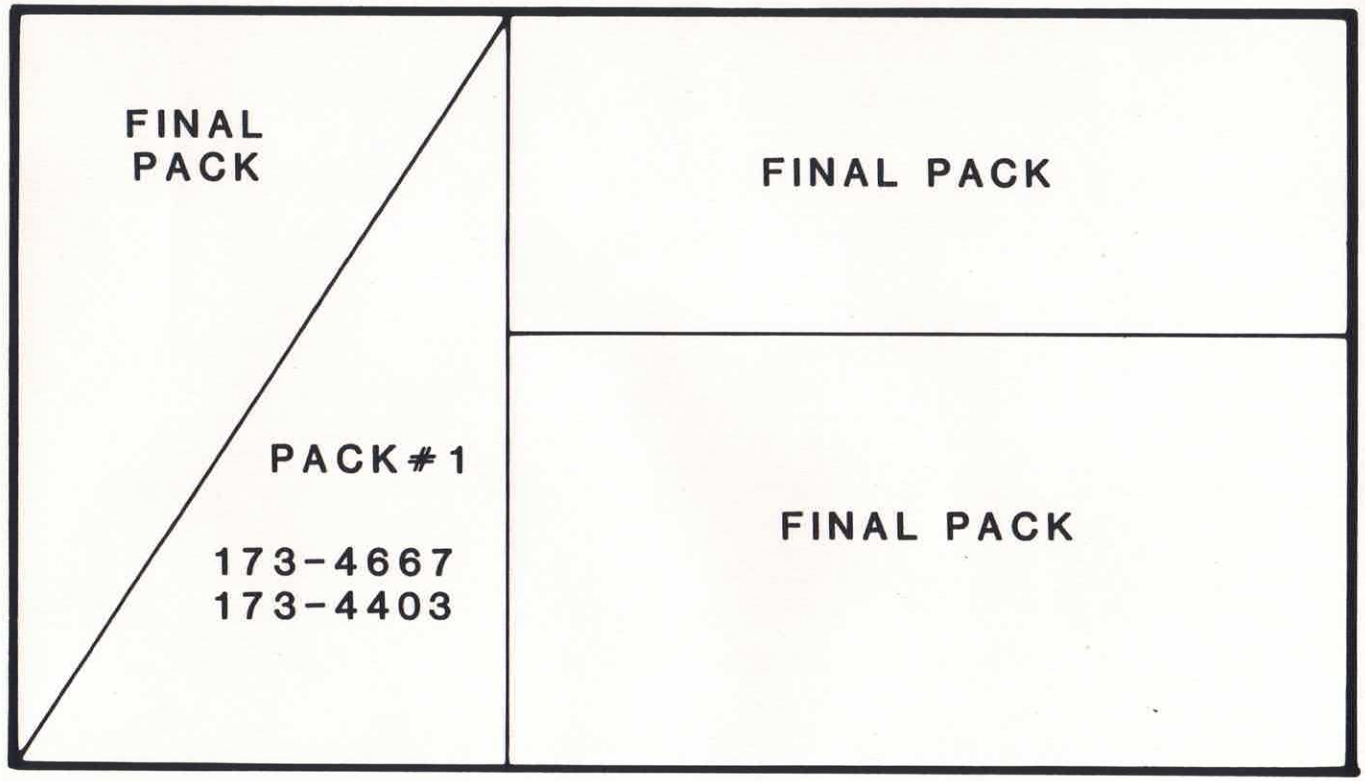
Heathkit®

PACK INDEX SHEET

Do NOT unpack . . . . . until the Manual calls for each **PACK** by number. Some of the 171, 172, and/or 173-series numbers are shown to help you indentify each **PACK** (the 171, 172, and/or 173-series part numbers on bags and boxes may have more digits than shown).

DO NOT USE 171, 172, and/or 173-series numbers when ordering replacement parts.



PK#1- FINAL
GR-9009
592-295

Heathkit ® Manual for the

9" PORTABLE COLOR TELEVISION

Model GR-9009

595-3824-06

Please perform the following steps and assemble your Manual before you build your kit. Do not unpack your kit until you are instructed to do so.

(✓) Remove the binder cover and 3-ring binder from the top of this carton. Refer to the "Pack Index Sheet" and locate Pack #1. Then locate the envelope marked "Binder Hdw," and remove the hardware from it.

(✓) Refer to Figure 1 and position the binder cover with the large hole as shown.

(✓) Determine which side of the rings unhook. Then position the ring assembly as shown and mount it to the cover with the binder hardware: two 6-32 x 3/8" nylon screws, two flat washers, and two 6-32 nuts. Do not over-tighten the hardware.

(✓) If it has not already been done, carefully remove the Manual and Illustration Booklet, Schematic, etc. from its wrapping.

( ) Unfasten the rings (if they are fastened) and place the Manual in the binder. Set the Illustration Booklet and any other Manual portions aside.

( ) Refasten the rings.

( ) Discard this page and proceed with your Manual. NOTE: Place the Illustration Booklet and any other Manual portions in the back of the binder after you assemble your kit.

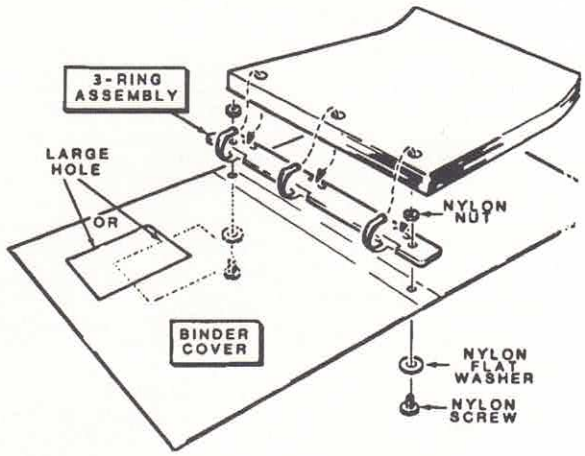


Figure 1

HEATH COMPANY
BENTON HARBOR, MICHIGAN 49022

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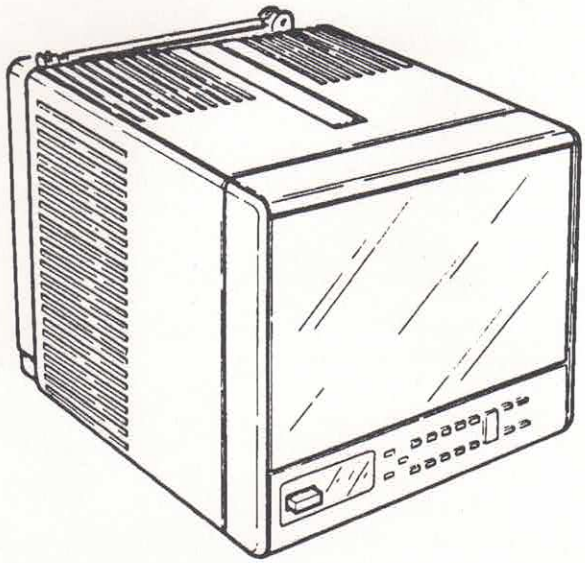
9" PORTABLE COLOR TELEVISION

Model GR-9009

595-3824-06



WARNING: Do not expose this TV Set to rain or moisture. Never operate the Set if liquid has accidentally spilled into it. If this should happen, have your Set checked by a qualified service technician before you use it again. Otherwise, fire or electrical shock could result.

NOTE: Be sure to read the "Television Safety Guide."

HEATH COMPANY
BENTON HARBOR, MICHIGAN 49022

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SCHEMATIC — (fold-in)

WARRANTY — Inside front cover

CUSTOMER SERVICE — Inside rear cover

Federal Communications Commission requirements prescribe maximum RF radiation from Receivers operating above 30 MHz. This Television Receiver will meet these requirements when constructed in strict accordance with the instructions in this Manual, using only components and exact equivalent thereof. In order to meet legal requirements, be certain to follow the instructions exactly as they are stated in this Manual.

INTRODUCTION

Your new Heathkit 9" Portable Color TV Set, Model GR-9009, is easy to assemble and will provide you with excellent performance wherever you take it. It is easy to operate and has all of the latest solid-state circuit reliability. Most circuit boards are preassembled, and all critical assemblies are pre-assembled and factory- aligned.

This Portable Color Television also has:

- **A Chromacolor® Contrast Picture Tube** — with reflection-absorbing glass for exceptional contrast and color fidelity. Its black matrix and tinted phosphors give you pure, bright, true-to-life colors. The in-line electron gun produces remarkable picture detail and dramatically improved edge and corner sharpness.

- **178 Channel Tuning Capability** — that selects all VHF/UHF and 122 cable channels without the need for an external converter (with the exception of encoded programs).

- **Quartz-Controlled Electronic Tuning** — that computer-locks onto the exact broadcast frequency for the best reception. Channel selection is fast, convenient, and exact, and there are no moving parts to wear out.

- **Phase-Lock Loop Tuning** — which locks in the signal during normal TV operation. It also has a search position which "pulls in" off-frequency channels that you may receive from cable, master antenna systems, or video games.

- **Programmable Up/Down Channel Scanning** — that you can program to scan only favorite or locally available channels.

- **Timed Entry Channel Selection** — which offers a 2-second automatic channel change delay after each selection. If you wish an instant channel change, simply press the ENTER key after you select the channel.

- **3-digit LED (Light-Emitting Diode) Display** — for large, easy-to- read numbers and letters.

- **An Auto-Control Color System** — to maintain accurate color, tint, and contrast once adjusted. The system also blends color levels and tint for lifelike flesh tones and assures channel-to-channel color stability.

- **An Auto-Picture Control** — that keeps the brightness level and color saturation in balance simultaneously as you adjust it.

- **A Crosshatch Generator** — for performing convergence and color purity adjustments. The generator is built into the TV Set.

- **A Digital, True-Lock Picture Hold** — that eliminates the need for vertical and horizontal hold controls.

- **A Reliant Chassis** — that features large-scale integrated circuits (LSIs) and a modular design. Each module is completely pretested and factory aligned.

- **Two-Way AC/DC Operation** — which allows you to go anywhere with this portable TV Set. It operates on normal house current (AC) or on a 12-volt (negative ground) automobile electical system (DC). It includes a fused power cord that plugs into your car or camper's cigarette lighter.

- **Sun Screen** — that cuts glare and reduces reflection in strong outdoor light.

- **An Earphone** — for private listening.

- **A Built-In Monopole Whip Antenna** — with a handy storage clip on the cabinet.

The GR-9009, 9" Portable Color TV Set, with all of its advanced features, is designed to provide you with years of convenient entertainment and trouble-free performance.

SPECIFICATIONS

Antenna Input Impedance	75 Ω, with internal VHF/UHF splitter.
Tuning Range	178 channels, see Pages 53 - 62.
Speaker	3" round, 32 Ω impedance.
Anode Voltage	18 kV ± 2 kV.
Power Requirements	105 to 130 volts, 60 Hz, 65 watts; 13.8 volts DC, 5 amperes.
Picture Tube	9" diagonal, internal magnetic shield, 90° deflection, Hi-Bi focus.
Picture Tube Screen	52% transmission glass, negative guardband, black matrix.
Screen Area	41.7 square inches.
Cabinet Dimensions	10-1/4" high x 10-1/2" wide x 11-7/8" deep (26.0 x 26.7 x 30.2 cm).
Net Weight	18 lbs. (8.2 kg).

The Heath Company reserves the right to discontinue products and to change specifications at any time without incurring any obligation to incorporate new features in products previously sold.

UNPACKING INSTRUCTIONS

Refer to the "Pack Index Sheet" that you found just inside the carton marked "OPEN FIRST." This sheet shows you how the carton is divided into compartments, which are referred to in this Manual as "packs." Instructions at the beginning of each Parts List tell you which pack to open. Do not remove any parts from the carton or its compartments until they are specifically called for by a Parts List in this Manual.

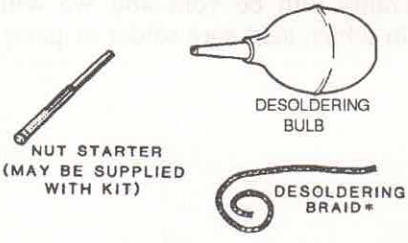
WARNING: Do not make adjustments to the pre-wired circuit board modules. These modules were factory-aligned and must not be readjusted unless you are specifically instructed to do so in the Manual.

ASSEMBLY NOTES

TOOLS

You will need these tools to assemble your kit.

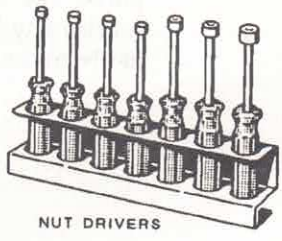
PLIERS — LONG-NOSED PLIERS — DIAGONAL CUTTERS — WIRE STRIPPERS — 1/8" & 1/4" BLADE SCREWDRIVERS — PHILLIPS SCREWDRIVER



NUT STARTER (MAY BE SUPPLIED WITH KIT)

DESOLDERING BULB

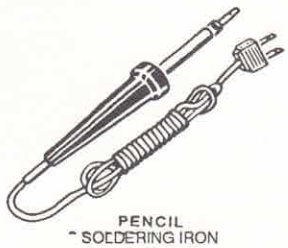
DESOLDERING BRAID*



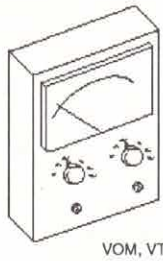
NUT DRIVERS

OTHER HELPFUL TOOLS

*To Remove Solder from Circuit Connections



PENCIL SOLDERING IRON (22 to 25 WATTS)



VOM, VTVM, OR DMM (optional)

ASSEMBLY

1. Follow the instructions carefully. Read the entire step before you perform each operation.

2. The illustrations in the Manual are called Pictorials and Details. Pictorials show the overall operation for a group of assembly steps; Details generally illustrate a single step. When you are directed to refer to a certain Pictorial "for the following steps," continue to use that Pictorial until you are referred to another Pictorial for another group of steps.

3. Most kits use a separate "Illustration Booklet" that contains illustrations (Pictorials, Details, etc.) that are too large for the Assembly Manual. Keep the "Illustration Booklet" with the Assembly Manual. The illustrations in it are arranged in Pictorial number sequence.

4. Position all parts as shown in the Pictorials.

5. Solder a part or a group of parts only when you are instructed to do so.

6. Each circuit part in an electronic kit has its own component number (R2, C2, etc.). Use these numbers when you want to identify the same part in the various sections of the Manual. These numbers, which are especially useful if a part has to be replaced, appear:

   — In the Parts List,

   — At the beginning of each step where a component is installed,

   — In some illustrations,

   — In the Schematic,

   — In the sections at the rear of the Manual.

7. When you are instructed to cut something to a particular length, use the scales (rulers) provided at the bottom of the Manual pages.

SAFETY WARNING: Avoid eye injury when you cut off excessive lead lengths. Hold the leads so they cannot fly toward your eyes.

SOLDERING

Soldering is one of the most important operations you will perform while assembling your kit. A good solder connection will form an electrical connection between two parts, such as a component lead and a circuit board foil. A bad solder connection could prevent an otherwise well-assembled kit from operating properly.

It is easy to make a good solder connection if you follow a few simple rules:

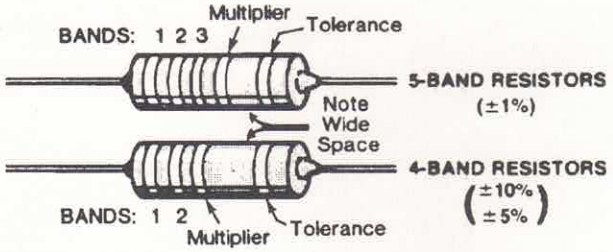
1. Use the proper type of soldering iron. A 22- to 25-watt pencil soldering iron with a 1/8" or 3/16" chisel or pyramid tip works best.

2. Keep the soldering iron tip clean. Wipe it often on a wet sponge or cloth; then apply solder to the tip to give the entire tip a wet look. This process is called "tinning," and it will protect the tip and enable you to make good connections. When the solder tends to "ball" or does not stick to the tip, the tip needs to be cleaned and retinned.

NOTE: Always use rosin core, radio-type solder (60:40 tin-lead content) for all of the soldering in this kit. This is the type we have supplied with the parts. The Warranty will be void and we will not service any kit in which acid core solder or paste flux has been used.

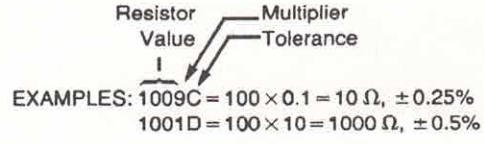
RESISTORS

Resistors are identified in Parts Lists and steps by their resistance value in Ω (ohms), kΩ (kilohms), or MΩ (megohms). They are usually identified by a color code of four or five color bands, where each color represents a number. See the "Resistor Color Code" chart. These colors are given in the steps in their proper order (except the last band, which indicates a resistor's "tolerance"; see the "Resistor Tolerance Chart"). You do not need to memorize the color codes.



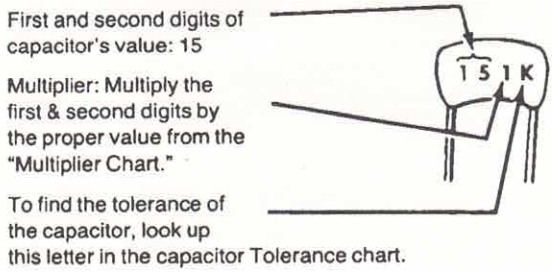
Occasionally, a "precision" or "power" resistor may have the value stanped on it. The letter R, K, or M may also be used at times to signify a decimal point, as in: 2R2 = 2.2 Ω
2K2 = 2.2 kΩ, or 2200 Ω
2M2 = 2.2 MΩ

Precision resistors may also be marked as shown in the following examples. The values of the multipliers are shown in the "Multiplier Chart," and the tolerance values are shown in the "Resistor Tolerance" chart.



CAPACITORS

Capacitors will be called out by their capacitance value in µF (microfarads) or pF (picofarads) and type: ceramic, Mylar®, electrolytic, etc. Some capacitors may have their value printed in the following manner:


First and second digits of capacitor's value: 15
Multiplier: Multiply the first & second digits by the proper value from the "Multiplier Chart."
To find the tolerance of the capacitor, look up this letter in the capacitor Tolerance chart.
151K

RESISTOR COLOR CODE

	Band 1	Band 2 (if used)	Band 3	Multiplier
Color	1st Digit	2nd Digit	3rd Digit	
Black	0	0	0	1
Brown	1	1	1	10
Red	2	2	2	100
Orange	3	3	3	1,000
Yellow	4	4	4	10,000
Green	5	5	5	100,000
Blue	6	6	6	1,000,000
Violet	7	7	7	10,000,000
Gray	8	8	8	100,000,000
White	9	9	9	—
Silver	—	—	—	.01
Gold	—	—	—	.1

RESISTOR TOLERANCE

	COLOR OR LETTER	
±10%	SILVER	
±5%	GOLD	J
±2%	RED	G
±1%	BROWN	F
±0.5%	GREEN	D
±0.25%	BLUE	C
±0.1%	VIOLET	B
±0.05%	GRAY	

MULTIPLIER CHART

FOR THE NUMBER:	MULTIPLY BY:	FOR THE NUMBER:	MULTIPLY BY:
0	1	4	10,000
1	10	5	100,000
2	100	8	0.01
3	1000	9	0.1

CAPACITOR TOLERANCE

LETTER	10 pF OR LESS	OVER 10 pF
B	±0.1 pF	
C	±0.25 pF	
D	±0.5 pF	
F	±1.0 pF	±1%
G	±2.0 pF	±2%
H		±3%
J		±5%
K		±10%
M		±20%

EXAMPLES: 151 K = 15 X 10 = 150 pF
759 = 75 X 0.1 = 7.5 pF

NOTE: The letter "R" may be used at times to signify a decimal point, as in: 2R2 = 2.2 (pF or µF).

CROSSHATCH GENERATOR CIRCUIT BOARD

PARTS LIST

Remove the parts from Pack #1 and check each part against the following list. The key numbers correspond to the numbers on the "Crosshatch Generator Circuit Board Parts Pictorial." Do not remove components that are supplied on a tape from the tape until you use them in a step. If a part is packed in an individual envelope with the part number on it, identify the part; then return it to the envelope until it is called for in a step. Do not throw away any packing material until you account for all the parts.

To order a replacement part, always include the PART NUMBER. Use the Parts Order Form furnished with this kit. If a Parts Order Form is not available, refer to "Replacement Parts" inside the rear cover of this Manual.

A replacement part may look slightly different than the original part, or may have different printing on it. In any case, the performance of the replacement part will meet or exceed the requirements of the original part. For example: A 15-volt capacitor (10 µF, 15V) may be replaced with a 25-volt capacitor (10 µF, 25V).

KEY No.	HEATH Part No.	QTY.	DESCRIPTION	CIRCUIT Comp. No.

CAPACITORS

A1	20-118	1	15 pF mica	C903
A1	20-115	1	300 pF mica	C902
A2	27-47	4	.1 µF Mylar	C901, C905, C906, C907
A3	25-885	1	100 µF electrolytic	C904

TRANSISTORS — INTEGRATED CIRCUITS (ICs)

NOTE: Transistors and integrated circuits may be marked for identification in any one of the following four ways:

1. Part number.
2. Type number. (For integrated circuits, this refers only to the numbers and letters shown in **BOLD** print. Disregard any other numbers or letters shown on the IC.)
3. Part number and type number.
4. Part number with a type number other than the one shown.

CAUTION: Some of the integrated circuits can be easily damaged by static electricity. Do **not** remove ICs that are installed in conductive foam pads until you are instructed to do so.

KEY No.	HEATH Part No.	QTY.	DESCRIPTION	CIRCUIT Comp. No.

Transistors — Integrated Circuits (Cont'd.)

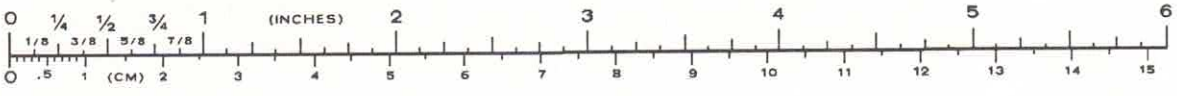
B1	417-801	5	MPSA20 transistor	Q901-Q905

KEY No.	HEATH Part No.	QTY.	DESCRIPTION	CIRCUIT Comp. No.
Transistors and Integrated Circuits (Cont'd.)				
B2	443-603	1	CD **4011** or **14011** IC	U901
B2	443-737	1	MC **14518** IC	U902
B2	443-777	1	MC **14528** or 4098 IC	U903
WIRE				
	344-15	16"	Black stranded	
	344-50	12"	Black solid	
	344-52	12"	Red	
	344-54	12"	Yellow	
	344-55	12"	Green	
	344-56	12"	Blue	
	344-59	12"	White	
LABELS*				
C1	235-840	1	Shock Hazard label	
C2	235-1138	1	CRT Identification label	
C3	235-1139	1	Safety/Service Reference label	
C4	235-1140	1	Bilingual Warning label	
C5	390-1192	1	Manufacturing date label	
C6	390-2975	1	Ground label	
C7	390-3011	1	Safety Warning label	
C8	390-3012	1	Model/Power Consumption label	
C9		1	Blue and white label	

*These items are packed inside this Manual. Set them aside for use later.

KEY No.	HEATH Part No.	QTY.	DESCRIPTION	CIRCUIT Comp. No.
MISCELLANEOUS				
D1	10-312	1	10 kΩ control	R911
D2	60-645	1	Slide switch	SW901
	85-2903-2	1	Crosshatch generator circuit board	
D3	354-5	1	Cable tie	
D4	432-162	7	Male pin (includes one extra)	
D5	432-163	7	Female pin (includes one extra)	
D6	432-836	1	Male connector shell	
D7	432-837	1	Female connector shell	
D8	434-298	1	14-pin IC socket	
D8	434-299	2	16-pin IC socket	
	597-260	1	Parts Order Form*	
	597-1766	1	Television Safety Guide*	
		1	Assembly Manual (see title page for part number)	
			Solder	
BINDER PARTS**				
E1	250-357	2	6-32 x 3/8" nylon screw	
E2	252-3	2	6-32 nut	
E3	253-14	2	#6 flat washer	
	597-4460	1	Binder cover	
	701-233	1	3-ring binder	

**These items are used to assemble the Manual.



TAPED COMPONENTS

The remaining parts are supplied on taped strips. It is not necessary to check them against the following list.

RESISTORS

NOTE: All resistors have a power rating of 1/4-watt and a tolerance of 5% (fourth band gold) unless otherwise noted.

KEY No.	HEATH Part No.	QTY.	DESCRIPTION	CIRCUIT Comp. No.
	6-101	1	100 Ω, 1/2-watt (brn-blk-brn)	R921
	6-221-12	1	220 Ω (red-red-brn)	R919
	6-222-12	1	2200 Ω (red-red-red)	R923
	6-272-12	1	2700 Ω (red-viol-red)	R917
	6-332-12	2	3300 Ω (org-org-red)	R902, R905
	6-472-12	1	4700 Ω (yel-viol-red)	R924
	6-682-12	1	6800 Ω (blu-gry-red)	R909

Resistors (Cont'd.)

KEY No.	HEATH Part No.	QTY.	DESCRIPTION	CIRCUIT Comp. No.
	6-103-12	4	10 kΩ (brn-blk-org)	R907, R914, R916, R922
	6-153-12	3	15 kΩ (brn-grn-org)	R903, R908, R915
	6-273-12	1	27 kΩ (red-viol-org)	R912
	6-333-12	2	33 kΩ (org-org-org)	R901, R904
	6-104-12	2	100 kΩ (brn-blk-yel)	R906, R913
	6-154-12	1	150 kΩ (brn-grn-yel)	R918

DIODES

KEY No.	HEATH Part No.	QTY.	DESCRIPTION	CIRCUIT Comp. No.
	56-620	1	1N4744A	D905
	56-56	2	1N4149	D901, D902

STEP-BY-STEP ASSEMBLY

Refer to Pictorial 1-1 as you read the following Notes.

NOTES:

1. Many circuit board drawings, such as the one shown in Pictorial 1-1, are divided into two or more sections. You will be working on each of these sections in a specific series of steps.

2. In each series of steps, you will install parts in a top-to-bottom, left-to-right sequence. Occasionally, you may be directed to install a part out of sequence.

3. Check off each step as you perform it. You may also wish to place a check mark near each component on the Pictorial as you install it.

4. In general, solder instructions are given only at the end of a series of similar steps; you may solder more often if you wish.

5. The circuit board has foil on one side. This is referred to as the "foil side," while the other side has the component outlines shown on it and is referred to as the "component side."

( ) Position the circuit board as shown in the Pictorial with the component side up. Always install components on the component side of the circuit board and solder the leads to the foil on the other side.

( ) Cut the "Taped Components Chart" from the last page in the Illustration Booklet. Make sure you read the instructions at the top of the chart before you use it. Note that it is divided into numbered sections which correspond to the numbered sections on the circuit board pictorial.

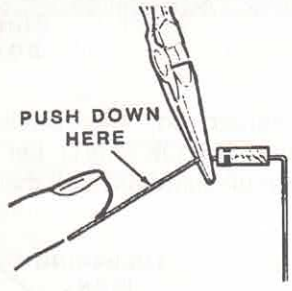
IMPORTANT: The components are in assembly sequence. Make sure that you do not install a component out-of-sequence; otherwise, the remaining components could also be out-of-sequence.

NOTE: When you install a component that has its value printed on it, position the value marking up, so you can easily read it. You should mount diodes with their type or part number up, if possible.

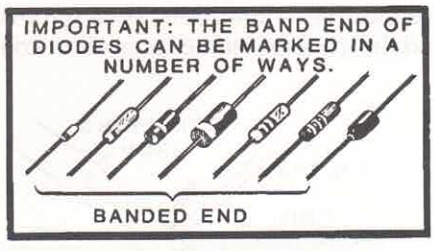
Refer to the "Taped Components Chart" to install the following parts.

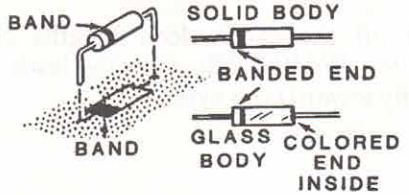
Section 1

(✓) Hold a 1N4744A diode (#56-620) by the body and bend the leads straight down to fit the circuit board hole spacing.



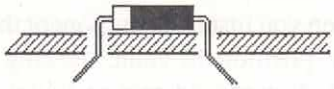
(✓) D905: Identify the banded end of the diode. Then position the diode with the banded end as shown and push the leads through the holes at the indicated circuit board location.





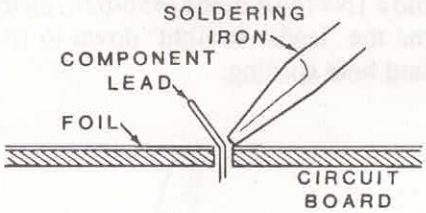
CAUTION: ALWAYS POSITION THE BANDED END OF A DIODE AS SHOWN ON THE CIRCUIT BOARD.

( ) Press the diode against the circuit board and bend the leads out slightly to hold it in place.

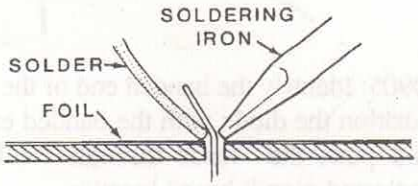


Solder the diode leads to the circuit board as follows:

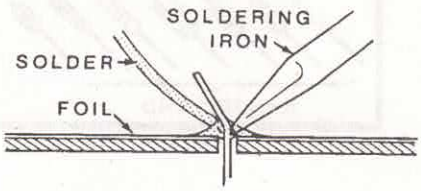
1. Push the soldering iron tip against both the lead and the circuit board foil. Heat both for two or three seconds.



2. Apply solder to the other side of the connection. IMPORTANT: Let the heated lead and the circuit board foil melt the solder.



3. As the solder begins to melt, allow it to flow around the connection. Then remove the solder and the iron and let the connection cool.



( ) Cut off the excess lead lengths close to the connection. **WARNING**: Clip the leads so the ends will not fly toward your eyes.

( ) Check each connection. Compare it to the illustrations on this Page. After you have checked the solder connections, proceed with the assembly. Use the same soldering procedure for each connection.

NOTE: Make sure you installed the zener diode at D905, in the instructions that begin on Page 19.

( ) R921: 100 Ω, 1/2-watt, (brn-blk-brn) resistor.

( ) R923: 2200 Ω (red-red-red) resistor.

( ) R912: 27 kΩ (red-viol-org) resistor.

( ) R909: 6800 Ω (blu-gry-red) resistor.

( ) R922: 10 kΩ (brn-blk-org) resistor.

( ) R917: 2700 Ω (red-viol-red) resistor.

( ) R916: 10 kΩ (brn-blk-org) resistor.

( ) Solder the leads to the foil and cut off the excess lead lengths.

Section 2

( ) R913: 100 kΩ (brn-blk-yel) resistor.

( ) R919: 220 Ω (red-red-brn) resistor.

( ) R924: 4700 Ω (yel-viol-red) resistor.

( ) D902: 1N4149 diode (#56-56).

( ) R918: 150 kΩ (brn-grn-yel) resistor.

( ) R908: 15 kΩ (brn-grn-org) resistor.

( ) Solder the leads to the foil and cut off the excess lead lengths.

Section 3

( ) R914: 10 kΩ (brn-blk-org) resistor.

( ) R901: 33 kΩ (org-org-org) resistor.

( ) R902: 3300 Ω (org-org-red) resistor.

( ) R915: 15 kΩ (brn-grn-org) resistor.

NOTE: When a wire is called for, cut the wire to the indicated length and then remove 1/4" of insulation from each end. Bend the bare wire ends down 90° and insert them in the circuit board holes. Solder the wire to the foil and cut off the excess wire lengths.

( ) 1-1/8" black solid wire at W901.

( ) R903: 15 kΩ (brn-grn-org) resistor.

( ) D901: 1N4149 diode (#56-56).

( ) R904: 33 kΩ (org-org-org) resistor.

( ) Remove all of the insulation from a 1-3/4" yellow wire. Use this wire when a step calls for bare wire.

( ) 3/4" bare wire at W902.

( ) R905: 3300 Ω (org-org-red) resistor.

( ) R906: 100 kΩ (brn-blk-yel) resistor.

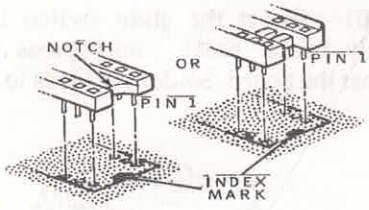
( ) 1" bare wire at W903.

( ) R907: 10 kΩ (brn-blk-org) resistor.

( ) Solder the leads to the foil and cut off the excess lead lengths.

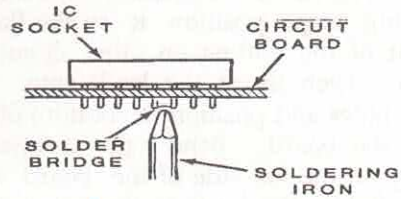
Refer to Pictorial 1-2 for the following steps.

NOTE: Before you install an IC socket, make sure the pins are straight. If there is any kind of identification mark (notch, dot, arrowhead, etc,) at or near one end of the socket, place this marked end toward the index mark on the circuit board (this index mark should still be visible after you install the socket). Then start the pins into the circuit board holes.



Hold the socket in place while you turn the board over and lay it on top of the socket on your work surface. The board will hold the socket in place. At first, solder only two pins at diagonally opposite corners of the socket. When the solder cools, check to make sure the socket is tight against the circuit board. If not, reheat the pins while you press against the socket to reseat it. Then solder the remaining pins to the foil.

NOTE: A solder bridge may occur when you make solder connections at closely spaced foils. Therefore, after each solder step, carefully inspect the foil for solder bridges and remove any that have formed. To remove a solder bridge, hold the circuit board foil-side-down as shown, and hold the soldering iron tip between the two points that are bridged. The solder will flow down the soldering iron tip to clear the bridge.



( ) 14-pin IC socket at U901.

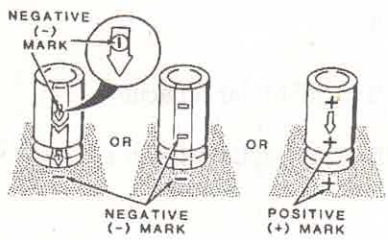
( ) 16-pin IC socket at U902.

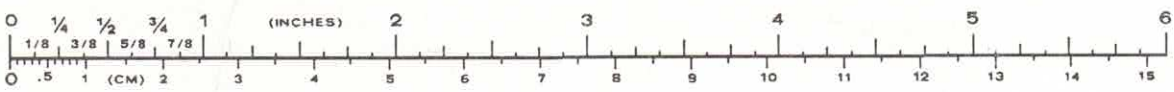
( ) 16-pin IC socket at U903.

Refer to Pictorial 1-3 for the following steps.

Section 1

NOTE: Before you install an electrolytic capacitor, look at it and identify the leads. One lead will have either a negative (-) mark or a positive (+) mark near it on the side of the capacitor. (The marking for a negative lead may look like an oblong bar, sometimes with a circle around it, inside an arrow.) Be sure to install the negative lead in the negative-marked hole, and the positive lead in the positive-marked hole.



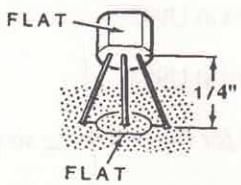


( ) C904: 100 µF electrolytic capacitor.

( ) C907: .1 µF Mylar capacitor.

( ) R911: 10 kΩ control. Insert the leads into the circuit board holes as shown and solder them to the foil.

NOTE: Whenever you install a transistor, as in the following step, position it so the flat side is over the flat of the outline on the circuit board, as shown. Then insert the leads into their circuit board holes and position the bottom of the case 1/4" above the board. Bend the transistor leads out slightly on the foil side of the board to hold it in place. Solder the leads to the foil and cut off the excess lead lengths.



( ) Q905: MPSA20 transistor (#417-801).

( ) C903: 15 pF mica capacitor.

( ) C902: 300 pF mica capacitor.

( ) C906: .1 µF Mylar capacitor.

( ) Solder the leads to the foil and cut off the excess lead lengths.

Section 2

( ) C901: .1 µF Mylar capacitor.

( ) C905: .1 µF Mylar capacitor.

Install MPSA20 transistors (#417-801) at the following four locations:

( ) Q904.
( ) Q901.
( ) Q902.
( ) Q903.

( ) Solder the leads to the foil and cut off the excess lead lengths.

IC INSTALLATION

Refer to Pictorial 1-4 for the following steps.

CAUTION: Integrated circuits (ICs) are complex electrical devices that perform many complicated operations in a circuit. These devices can be damaged during installation. Read all of the following information before you install the ICs.

The ICs you will install in the following steps are MOS (metal oxide semiconductor) devices; they have been shipped in special pads to protect them from static electricity. Once you remove an IC from its pad, do not let go of it or lay it down until it is installed in its socket.

Install the ICs as shown in Detail 1-4A. When you bend the leads, as described in the Detail, hold the IC in one hand and place your other hand on your work surface before you touch the IC to it. This will equalize the static electricity between the work surface and the IC.

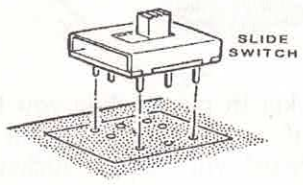
Install ICs at the following three locations:

( ) U903: MC14528 or 4098 IC (#443-777).

( ) U901: CD14011AE IC (#443-603).

( ) U902: MC14518 IC (#443-737).

( ) SW901: Insert the slide switch lugs into the circuit board holes and press them firmly against the board. Solder the leads to the foil.



Refer to Pictorial 1-5 for the following steps.

NOTE: When you are instructed to prepare a solid wire, as in the following step, cut it to the indicated length and remove 1/4" of insulation from the ends.

( ) Prepare the following wires:

4" black
4" red
4" yellow
4" green
4" blue
5" white

( ) Refer to the inset drawing and crimp and solder a male pin on one end of each of the prepared wires.

Insert the male pins on the end of the prepared wires into the female connector shell with ears as follows. Press the pin into its connector shell hole until you hear a faint locking "click." Then gently pull on the wire to make sure it has locked in place. The hole numbers are stamped next to the connector shell holes.

( ) Yellow wire into hole 1.

( ) Green wire into hole 2

( ) Red wire into hole 3.

( ) Black wire into hole 4.

( ) Blue wire into hole 5.

( ) White wire into hole 6.

( ) Cut the ears off the female connector shell.

Connect the free ends of the wires to the crosshatch generator circuit board as follows. After you install a wire, solder it to the foil and cut off the excess wire length.

( ) Red wire to hole F.

( ) Green wire to hole E.

( ) Yellow wire to hole A.

( ) Black wire to hole G.

( ) Blue wire to hole B.

( ) White wire to hole C.

NOTE: You will not use hole D.

Refer to Pictorial 1-6 for the following steps.

( ) Prepare the following wires:

6" yellow
6" black
6" blue
6" red
6" green
7" white

( ) Crimp and solder a female pin on one end of each of the prepared wires as shown in inset drawing #1.

Insert the female pins on the end of the prepared wires into the male connector shell as follows. Press each pin into its connector shell hole until it locks into place as before. The hole numbers are stamped on the connector shell next to the holes.

( ) Yellow wire into hole 1.

( ) Green wire into hole 2.

( ) Red wire into hole 3.

( ) Black wire into hole 4.

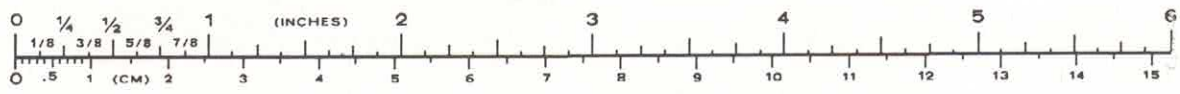
( ) Blue wire into hole 5.

( ) White wire into hole 6.

( ) Cut the ears off the male connector shell.

( ) Install a cable tie around the six wires at the location shown in the Pictorial. Cut off the excess cable tie as shown in inset drawing #2 and melt the sharp edges down with your soldering iron to prevent a possible scratch when you work inside the TV Set later on.

You will connect the remaining wire ends later. Set the male connector assembly aside until it is called for.



CIRCUIT BOARD CHECKOUT

Carefully inspect the circuit board for the following possible problems:

- Unsoldered connections.
- Poor solder connections.
- Solder bridges between foil patterns. NOTE: Refer to the "Circuit Board X-Ray Views" if you are uncertain and want to see the correct foil patterns.
- Protruding leads which could touch together or short to the chassis when the circuit board is mounted later.

Refer to the illustrations where the parts were installed as you make the following visual checks:

- Transistors for the proper installation.
- ICs for the proper type and installation.
- Diodes for the proper type and positioning of the banded end.
- Electrolytic capacitor for the correct position of the positive (+) or negative (-) markings.

Set the crosshatch generator circuit board aside until it is called for later.

CABINET

PARTS LIST

NOTE: When you unpack the remainder of this kit, be careful not to damage the smaller parts (speaker, etc.).

Remove the remaining parts from the carton and check each part against the following list. The key numbers correspond to the numbers on the "Cabinet Parts Pictorial." If a part is packed in an individual envelope with the part number on it, identify the part; then return it to the envelope until it is called for in a step. Do not throw away any packing material until you account for all the parts.

To order a replacement part, always include the PART NUMBER. Use the Parts Order Form furnished with this kit. If a Parts Order Form is not available, refer to "Replacement Parts" inside the rear cover of this Manual.

A replacement part may look slightly different than the original part, or may have different printing on it. In any case, the performance of the replacement part will meet or exceed the requirements of the original part. For example: A 15-volt capacitor (10 µF, 15V) may be replaced with a 25-volt capacitor (10 µF, 25 V).

CIRCUIT MODULES AND ASSEMBLIES

NOTE: The circuit modules are assembled, tested, and aligned. Do not make adjustments on these modules unless you are specifically instructed to do so in this Manual. To do so will void the Warranty on your TV set.

KEY No.	HEATH Part No.	QTY.	DESCRIPTION	CIRCUIT Comp. No.
A1	235-1110	1	DC/AC converter module	
A2	235-1111	1	Video output module	
A3	235-1112	1	Main module*	
A4	235-1034	1	Balun assembly	
A5	235-1101	1	Magnet assembly	
A6	235-1102	1	RC network/terminal assembly	
A7	235-1103	1	Degaussing coil w/connector 3T8	
A8	235-1104	1	Keyboard assembly	
A9	235-1105	1	On/off switch assembly w/connectors 3W3 and 3Z7	
A10	235-1408	1	Antenna bracket assembly	
A11	235-1108	1	Audio transformer assembly w/connector 4P4 and earphone jack	
A12	235-1109	1	Antenna assembly	
A13	235-1135	1	Deflection yoke assembly**	
A14	235-1147	1	VHF/UHF tuner	

* Save the packaging material for this module in case you should need it to return the module to the factory for service.

** This part may or may not have a terminal cover, depending on the manufacturer.

CABLE ASSEMBLIES

KEY No.	HEATH Part No.	QTY.	DESCRIPTION	CIRCUIT Comp. No.
B1	235-1040	1	9", 75 Ω cable w/plugs	
	235-1126	1	3A5/5A3 twisted cable	
	235-1127	1	2C5/5C2 twisted cable	
	235-1128	1	6K5/4M6/3K6 cable	
	235-1129	1	3E3/3E3 cable	
	235-1130	1	3U3/3U3 cable	
	235-1131	1	3S8/8S3 cable	
B2	235-1132	1	16" wire w/terminals	

PLASTIC AND NYLON PARTS

C1	235-145	2	Small wire twist	
C2	235-1028	1	Cable retainer	
C3	235-1106	5	Thumbwheel knob	
C4	235-1116	1	Speaker mounting bracket	
C5	235-1119	1	Cabinet bottom	
C6	235-1120	1	Cabinet rear	
C7	235-1121	1	Cabinet front	
C8	235-1148	1	LED display window	

KEY No.	HEATH Part No.	QTY.	DESCRIPTION	CIRCUIT Comp. No.

Plastic and Nylon Parts (Cont'd.)

C9	235-1149	1	Sun screen
C10	354-7	4	8" cable tie
C11	490-1	1	Alignment tool

HARDWARE

NOTE: Hardware is shown full size in the Parts Pictorial so you can place any screw, nut, etc., you are uncertain about over the illustration. The hardware may be packed in more than one envelope. Open all of the hardware envelopes before you check the screws, nuts, etc. against the Parts List.

D1	235-385	2	Mounting clip
D2	235-958	1	#6 x 3/8" screw
D3	235-847	7	#8 x 5/16" screw
D4	235-1142	2	#8 x 3/8" screw
D5	235-394	11	#8 x 7/16" screw
D6	235-1143	4	#8 x 19/32" flat head screw
D7	235-1141	12	#8 x 5/8" screw
D8	235-1144	4	#8 x 1-3/8" screw w/washer
D9	235-220	1	Round slotted nut (M8 x .75 mm)
D10	235-1041	2	10-32 locknut
D11	259-2	1	#8 solder lug

INSULATORS — OVERLAYS

E1	73-151	3	Double-stick tape
E2	73-159	2	Rubber insulator

KEY No.	HEATH Part No.	QTY.	DESCRIPTION	CIRCUIT Comp. No.

Insulators — Overlays (Cont'd.)

E3	75-891	2	6-3/4" x 5-1/4" insulating paper
E4	235-1027	1	Primary controls overlay
E5	235-1123	1	Secondary controls overlay
E6	235-1150	1	7-3/4" x 1-1/2" insulating paper
E7	235-1151	1	7" x 5-1/8" insulating paper

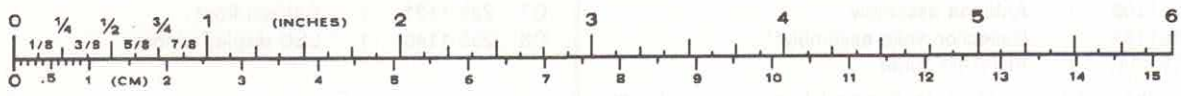
METAL PARTS

F1	204-3074	1	Circuit board mounting bracket
F2	235-1115	1	Handle support bracket
F3	235-1117	2	Cabinet front mounting bracket
F4	235-1118	1	Cabinet front support bracket
F5	235-1122	1	Cover
F6	235-1145	1	CRT ground contact

MISCELLANEOUS

G1	235-297	1	Earphone	
G2	235-1113	1	AC power cord	
G3	235-1114	1	DC power cord	
G4	235-1124	1	Handle	
G5	235-1125	1	3" speaker	
G6	235-1136	1	A23JAN99X CRT*	CRT1
G7	235-1146	3	Rubber wedge	
G8	235-1459	2	Rubber pad	
G9	260-16	2	Alligator clip	
G10	490-168	1	Open-end wrench	

* Cathode Ray Tube



STEP-BY-STEP ASSEMBLY

Refer to Pictorial 2-1 for the following steps.

( ) Refer to Detail 2-1A and position the LED display window over the left side of the cabinet front as shown. Insert the tab on the right side of the window into the corresponding notch in the cabinet front. Then push the left side of the window into the cabinet front until it snaps into place.

( ) Refer to Detail 2-1A and carefully remove the backing paper from the primary controls overlay. Insert the four overlay tabs into the corresponding slots in the cabinet front. Then press the overlay against the cabinet front so it adheres properly. Using the blade of a screwdriver, carefully bend the three indicated tabs over on the inside of the cabinet front as shown in the inset drawing in Detail 2-1A.

NOTES:

1. Place a soft towel or a clean throw rug on your work surface to protect the cabinet front as you perform the following steps.

2. In all of the assembly steps, "top," "bottom," "left," and "right" refer to these positions as they are shown in the illustration without regard to the actual left or right side of the cabinet.

3. Some of the following steps will be more difficult to perform because of the compactness of your TV Set. Therefore, be sure to work at a slow pace as you perform these steps.

4. When you install screws in the following steps, make sure they go into the cabinet holes straight and do not overtighten them.

( ) Position the cabinet front as shown in the Pictorial.

( ) If the LED display on the keyboard assembly is protected by a thin film, carefully remove the film.

( ) Position the keyboard assembly with the LED display to the right as shown. Then mount the assembly and 7-3/4" x 1-1/2" insulating paper to the inside of the cabinet front at FA, FB, FC, and FD with #8 x 7/16" screws. Be sure the small locating tabs (between the two mounting bosses) on each side enter their corresponding holes in the insulating paper before you tighten the screws. Lay the cables over the lower edge of the cabinet front.

( ) Press the off/on switch assembly button so it is in the "in" position. Then mount the switch assembly to the inside of the cabinet front at FE and FF with #8 x 7/16" screws. Be sure the two small locating tabs near the mounting bosses enter their corresponding holes in the switch assembly mounting plate before you tighten the screws. Also, do not pinch the black and white wires at the top of the keyboard assembly. Lay the switch cables over the lower edge of the cabinet front.

( ) Mount a cabinet front mounting bracket to the inside of the cabinet front at FG with a #8 x 5/8" screw. Position the bracket as shown.

( ) Similarly, mount another cabinet front mounting bracket at FH.

( ) Mount the indicated end of the cabinet front support bracket to the inside of the cabinet front at FJ with a #8 x 7/16" screw. Be sure the indicated surface of the support bracket is parallel with the right edge of the cabinet front as shown.

WARNING: Due to the high vacuum, handle the CRT (picture tube) with extreme care. Do not strike, scratch, or subject the CRT to more than moderate pressure at any time. Never lift the CRT by its neck. A fracture of the glass could result in an implosion of considerable violence capable of causing serious personal injury. When you handle the CRT, be careful not to touch the anode socket (see Pictorial 2-1 for its location), as you could receive a severe electrical shock.

IMPORTANT: Do not set the CRT down so that any part of its weight rests on the neck of the tube. If you must set the CRT down, always set its face down on a soft cloth until you install it.

( ) Carefully open the CRT carton.

CAUTION: The CRT will have a metal band around it, just behind the face. Do not attempt to remove the band; to do so could cause an implosion and possible personal injury.

( ) Carefully remove the CRT from its carton and check for a plastic film covering the face of the CRT. If there is such a film, remove and discard it.

( ) Position the CRT with the anode socket as shown; then carefully place it inside the cabinet front so the brackets are over the four mounting bosses. Be careful not to bump the CRT neck when you work around it in the remaining steps.

( ) Refer to the inset drawing in Pictorial 2-1 and place the CRT ground contact over the top left CRT bracket so the mounting holes align as shown.

( ) Secure the CRT to the cabinet mounting bosses with #8 x 1-3/8" screws with washers. Use the open-end wrench supplied with this kit. Make sure these four screws are tight.

Use the following four numbered steps to install the degaussing coil w/connector 3T8 around the CRT.

( ) 1. Position the degaussing coil over the CRT with the connector wires located as shown in the Pictorial.

( ) 2. Temporarily lift the free end of the CRT ground contact just enough to slide the degaussing coil under it. Then lower the degaussing coil until it rests against the bottom two CRT brackets and two cabinet front mounting brackets.

( ) 3. Route an 8" cable tie under the top left bracket and over the degaussing coil as shown in the inset drawing and pull the cable tie tight. Cut off the excess cable tie and melt the remaining sharp edges of the cable tie down flat with your soldering iron. This will prevent a possible scratch when you are working inside the cabinet. Be careful not to touch the degaussing coil with your iron when you do this.

( ) 4. Similarly, install 8" cable ties around the remaining three corner CRT brackets and the degaussing coil. Keep the degaussing coil tightly along the top and right side of the CRT.

( ) Carefully slide the deflection yoke assembly over the neck of the CRT and position it against the bell. Tighten the hex-head mounting screw just enough to keep the yoke from moving. Position the terminal cover top parallel with the top edge of the cabinet front as shown in the Pictorial.

( ) Refer to Detail 2-1B and carefully slide the magnet assembly over the neck of the CRT until it is 2" from the end as shown in the inset drawing. Rotate all of the tabs so they point towards the top of the cabinet front. Position the mounting screw parallel with the sides of the cabinet front. Tighten the mounting screw just enough to hold the assembly in place.

Set the cabinet front assembly aside.

Refer to Pictorial 2-2 for the following steps.

( ) Carefully remove the backing paper from the secondary controls overlay. Then refer to Detail 2-2A and press the overlay against the cabinet bottom at the location shown.

( ) Locate the male connector assembly that you set aside earlier.

Refer to Detail 2-2B and connect the free wire ends coming from the male connector to the main module as follows. When you make a connection, form a small hook in the bare wire end, and then crimp and solder the wire to the indicated point on the main module. Raise the indicated lead off the circuit board as necessary; however, be careful not to put too much stress on the component or you may break it. Use only enough heat to make a good solder connection.

( ) Yellow wire coming from hole 1 to the indicated lead of inductor L2288 (red-red-blk-gld).

(✓) Green wire coming from hole 2 to the indicated lead of resistor RX2704 (brn-brn-red-gld).

(✓) Red wire coming from hole 3 to the indicated end of resistor R2714 .

(✓) Black wire coming from hole 4 to jumper wire W6.

(✓) Blue wire coming from hole 5 to the indicated lead of inductor L1231 (brn-red-blk-gld). NOTE: Temporarily remove the cover from the IF amplifier shield and move transistor Q1229 out of the way to gain access to this component. Route the wire under the shield. Refer to inset drawing #1 in Detail 2-2B. Be careful not to burn the transistor with your soldering iron.

(✓) White wire coming from hole 6 to the indicated foil pad on the bottom side of the circuit board. Refer to inset drawing #2 in Detail 2-2B.

(✓) Check the six wire connections and make sure they are properly soldered and are not touching any other component leads. NOTE: It would be very difficult to get to any of these wires later.

( ) Refer to Detail 2-2C and place the 7" x 5-1/8" insulating paper inside the cabinet bottom as shown.

Refer to Detail 2-2C and use the following three numbered steps to mount the main module to the inside of the cabinet bottom:

( )1. Position the main module over bosses BA, BB, BC, BD, and BE as shown. Make sure the locating pins at BA and BB enter their corresponding small circuit board holes as shown in the inset drawing in Detail 2-2C.

( )2. Mount the antenna bracket assembly to the main module with a #8 x 5/8" screw at BA. Make sure the locating pin at BA enters the corresponding hole in the antenna bracket assembly before you tighten the screw.

( )3. Secure the main module to the cabinet bottom with #8 x 5/8" screws at BB, BC, BD, and BE.

Refer to Pictorial 2-3 for the following steps.

(✓) Position the cabinet bottom assembly as shown in the Pictorial.

(✓) Refer to Detail 2-3A and mount the eyelet at the free end of the wire coming from the main module IF amplifier shield cover to the indicated hole in the antenna mounting bracket with a #8 x 5/16" screw. Be sure to position the eyelet as shown in the Detail before you tighten the screw.

(✓) Refer to Detail 2-3A and mount the audio transformer assembly and circuit board mounting bracket to the outside of the antenna bracket assembly with a #8 x 5/16" screw as shown.

Refer to the modules Pictorials on Pages 28 and 29 of the Illustration Booklet to identify the connectors in the following steps.

(✓) Install connector 4P4 on the cable coming from the audio transformer assembly onto main module plug 4P4.

(✓) Install connector 3A8 on the cable coming from the antenna bracket assembly onto main module plug 3A8.

NOTE: When you install the following cables, you will connect only one end of each cable. You will connect the remaining ends later.

(✓) Locate the 2C5/5C2 twisted cable and install connector 2C5 onto main module plug 2C5. Pass the free end of this cable inside the wire twist w/ post.

(✓) Locate the 3A5/5A3 twisted cable and install connector 3A5 onto main module plug 3A5. Pass the free end of this cable inside the wire twist w/ post.

(✓) Locate the 3U3/3U3 cable and install the connector at either end of this cable into module plug 3U3.

(✓) Locate the 3S8/8S3 cable and install connector 3S8 onto main module plug 3S8.

( ) Refer to Detail 2-3B and loosely mount the VHF/UHF tuner to the cabinet bottom at BF and BG with #8 x 5/8" screws. NOTE: You will pass cables under the unmounted end of the tuner later on.

NOTE: When you connect the 75 Ω coaxial cables in the following steps, be sure to push each plug all the way into the jack until it "locks" into place.

( ) Connect one end of the 9", 75 Ω coaxial cable to jack J1201 on the main module and the other end to the indicated jack on the VHF/UHF tuner.

( ) Connect the free end of the 75 Ω coaxial cable coming from the antenna bracket assembly to the indicated jack on the VHF/UHF tuner.

Locate cable assembly 6K5/4M6/3K6 and install its connectors at the following locations:

( ) Connector 6K5 onto VHF/UHF tuner plug 6K5.

( ) Connector 3K6 onto main module plug 3K6.

( ) Connector 4M6 onto main module plug 4M6.

( ) Install connector 6G4 on the free end of the cable coming from the main module onto VHF/UHF tuner plug 6G4.

( ) Locate the 16" wire w/terminals. Connect one end to the tab of EX3201 on the main module and the other end to the tab on the VHF/UHF tuner.

( ) Locate the 3E3/3E3 cable assembly and connect either connector to main module plug 3E3. You will connect the other end of this cable later.

( ) Slide the terminal at either end of the RC network/terminal assembly over the indica-ted tab of the VHF/UHF tuner.

Refer to Pictorial 2-4 for the following steps.

( ) Refer to Detail 2-4A and prepare a 6-3/4" x 5-1/4" insulating paper as shown.

( ) Remove and save the wire twist from the DC/AC converter module.

( ) Refer to Detail 2-4B and press the adhesive side of the insulating paper firmly against the DC/AC converter module heat sink. NOTE: Be sure that the top of the paper extends about 1/8" above the top edge of the converter module's heat sink as shown in the Detail.

( ) Refer to Detail 2-4B and mount the DC/AC converter module to the main module heat sink with #8 x 5/16" screws as shown.

Install the connectors at the free end of the cables coming from the main module to the DC/AC converter module as follows:

( ) Connector 3U3 onto plug 3U3.

( ) Connector 8S3 onto plug 8S3.

( ) Install connector 3R8 on the cable coming from the DC/AC converter module onto main module plug 3R8.

( ) Install connector 3E3 on the cable coming from the main module onto DC/AC converter mo-dule plug 3E3.

Refer to Pictorial 2-5 for the following steps.

( ) Refer to Detail 2-5A and position the cabinet front assembly next to the cabinet bottom assembly as shown.

( ) Refer to Detail 2-5A and route the free ends of cables 6A7 and 6B7, coming from the keyboard assembly, under the unmounted end of the VHF/UHF tuner and between the indicated bosses in the cabinet bottom.

( ) Refer to Detail 2-5A and mount the VHF/UHF tuner to the cabinet bottom at BH and BJ with #8 x 5/8" screws. Tighten the two screws at BF and BG securely. Make sure that you do not pinch any of the cables coming from the keyboard assembly as you tighten the screws.

( ) Slide the terminal at the free end of the RC network/terminal assembly over the ground tab on the cabinet front assembly.

CAUTION: In the following two steps, be sure you install the correct connector onto each tuner plug. Otherwise, you may seriously damage your TV Set later when you apply power to it.

Install the cable connectors coming from the keyboard assembly onto the VHF/UHF tuner plugs as follows. NOTE: These cables are short; therefore, you may have to lift the front or bottom assembly slightly to obtain the necessary lengths. Be careful not to overstress the cables.

( ) Connector 6A7 onto plug 6A7.

( ) Connector 6B7 onto plug 6B7.

( ) Refer to Detail 2-5B and carefully raise the cabinet bottom assembly, keeping it as close as possible to the front assembly, and carefully route the degaussing coil wires along the cabinet front as shown. Also, position all of the loose cables and their connectors (deflection yoke, off/on switch, degaussing coil, main module, etc.) out of the way.

Refer to Detail 2-5B and, while you hold the cabinet bottom near the front panel assembly, install the deflection yoke assembly cable connectors onto the main module plugs as follows. Work carefully, as these connectors are a bit difficult to install.

( ) Connector 2A3 onto plug 2A3.

( ) Connector 3S3 onto plug 3S3.

Refer to Detail 2-5B and use the following three numbered steps to secure the cabinet bottom assembly to the cabinet front assembly:

( ) 1. Place the lower lip of the cabinet bottom assembly inside the cabinet front assembly tabs as shown; then carefully lower the cabinet bottom assembly into place so the two sections fit together. Check to make sure that no cable wires are pinched and that the RC network/terminal assembly is not bent or stressed.

( ) 2. Making sure you do not contact the anode socket in the CRT, secure the free end of the cabinet front support bracket to the cabinet bottom with a #8 x 7/16" screw at BK. Make sure the locating pin at the boss enters the corresponding small hole in the bracket "foot" before you tighten the screw.

( ) 3. Secure the cabinet bottom to the cabinet front with #8 x 19/32" flat head screws at BL and BN.

NOTE: In the following step, you will install the earphone jack (coming from the audio transformer) in the cabinet front. This step is a bit more difficult than usual since it is difficult to start the round nut on the jack's threads. Take your time when you perform this step so you do not crossthread the nut. Also, be especially careful when you tighten the round slotted nut that you do not scratch the outside of the cabinet front with your screwdriver.

( ) Install the threaded end of the earphone jack into the left side of the cabinet front at FD and secure it with the round slotted nut (M8 x .75 mm). Position the jack with the wires as shown. Use the tip of a small-bladed screwdriver to carefully turn the nut until it is just snug as shown in the inset drawing in Pictorial 2-5. Do not overtighten the nut.

Refer to Pictorial 2-6 for the following steps.

( ) Position the cabinet assembly in an upright position as shown.

( ) Route the red degaussing coil wires through the wire twist w/post and twist the tie around both twisted cables and the degaussing coil wires to hold them in place.

( ) Route the degaussing coil wires as shown and plug connector 3T8 onto **DC/AC converter module** plug 3T8. NOTE: You may find it easier to make this connection if you temporarily unplug connector 3U3, which is just above plug 3T8. Once you connect 3T8, reconnect 3U3.

( ) Hook the end of a small wire twist through the indicated holes in the main module heat sink. Then gather the cables coming from the off/on switch assembly into a bundle and wrap the small wire twist around them to hold them in place.

Install the cable connectors coming from the front panel off/on switch to the DC/AC converter as follows:

( ) Connector 3W3 onto plug 3W3.

( ) Connector 3Z7 onto plug 3Z7.

WARNING: In the next step, do not touch the CRT anode connection. Touch only the rubber insulated portion of the lead. When you install the anode lead, be sure it goes all the way into the anode socket.

( ) Connect the anode lead connector coming from the main module to the CRT anode socket as shown in the inset drawing in Pictorial 2-6.

( ) Position the video output module next to the CRT as shown in the Pictorial.

Install the connectors at the free end of the cables coming from the main module to the video output module as follows:

( ) Connector 5A3 onto plug 5A3.

( ) Connector 5C2 onto plug 5C2.

( ) Connector 5X3 onto plug 5X3.

( ) If the CRT base pins are protected by a plastic cap, remove the cap and discard it.

( ) Install the video output module over the base of the CRT by carefully pushing it towards the front of the CRT until the module socket fits tightly against the base of the CRT.

( ) Install the terminal on the end of the wire coming from the video output module on the indicated tab of the CRT ground contact.

( ) Insert the round connector at the end of the wire coming from the main module into the corresponding connector at the end of the wire coming from the video output module. Twist the connectors counterclockwise to lock them in place.

( ) Refer to Detail 2-6A and gather both twisted cables and the two red degaussing coil wires into a bundle and place them inside the indicated insulating paper hole to hold them in place.

( ) Gather the black wire coming from the ground tab on the VHF/UHF tuner and the white wire coming from connector 5X3 on the video output module. Then place them inside the indicated insulating paper hole to hold them in place.

( ) Refer to Detail 2-6A and install small and large wire twists around the cables at the two indicated locations.

( ) Refer to Detail 2-6B and prepare the remaining 6-3/4" x 5-1/4" insulating paper as shown.

( ) Refer to Detail 2-6C and press the adhesive side of the paper firmly against the indicated side of the cover so it adheres properly. NOTE: Be sure the top of the paper extends about 1/8" above the top edge of the cover as shown in the Detail.

( ) Refer to Detail 2-6C and use the following three numbered steps to mount the cover to the DC/AC converter module. Position the round connector going to the video output module outside the cover:

( ) 1. Insert the two retainer clips on the short cover flange into the corresponding rectangular-shaped slots in the short flange of the DC/AC converter module heat sink. Then gently push the cover down until the small tab near the top of the flange snaps into the small round hole in the heat sink.

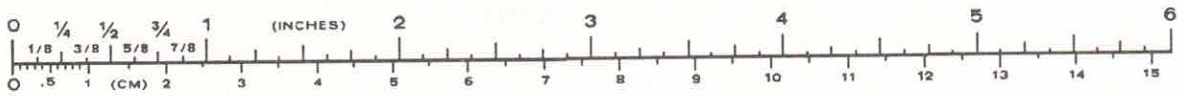
( ) 2. Pull the "fingers" at the free end of the cover over the edge of the long flange of the converter module heat sink. Then push the end of the fingers over the edge of the flange until the small tab snaps into the square hole in the flange.

( ) 3. Secure the cover to the heat sink flange with a #6 x 3/8" screw.

Refer to Pictorial 2-7 for the following steps.

( ) Install a thumbwheel knob onto each of the five indicated control shafts. Line up the flat inside each knob with the corresponding flat on the control shaft; then carefully push the knob all the way onto the shaft.

( ) Mount the crosshatch generator circuit board assembly to the circuit board mounting bracket with a #8 x 5/16" screw and a #8 solder lug at DA and a #8 x 5/16" screw at DB. Be sure to position the solder lug as shown before you tighten the screw.



NOTE: When you are instructed to prepare a wire, as in the following step, cut it to the indicated length and remove 1/4" of insulation from each end. If the wire is stranded, twist the fine wire strands tightly together and apply a small amount of solder to hold the fine strands together.

( ) Prepare two 8" lengths of black stranded wire.

( ) Refer to Detail 2-7A and install an alligator clip on one end of each of the two black wires.

( ) Slide a rubber insulator over the free end of each of the two black wires as shown in Detail 2-7A.

( ) Connect the free end of each of the two black wires to the #8 solder lug as shown in the Pictorial. Solder the connection.

( ) Connect the female connector shell on the wires coming from the crosshatch generator circuit board to the male connector on the wires coming from the main module.

( ) Carefully peel the backing paper from the two rubber pads. The refer to the inset drawing on Detail 2-7B and press the pads onto the speaker mounting bracket at the indicated locations.

( ) Refer again to Detail 2-7B and position the speaker mounting bracket as shown. Then mount the speaker onto the speaker mounting bracket with two mounting clips. Position the two speaker lugs as shown.

Connect the terminals at the free end of the wires coming from the audio transformer to the speaker as follows:

( ) White/brown wire to lug 1.

( ) Brown wire to lug 2.

One at a time, carefully remove (peel) the backing paper and then press each of the following labels in place onto the area noted in the step and as shown in the Pictorial.

( ) Safety Warning label (#390-3011) onto the back of the DC/AC converter module.

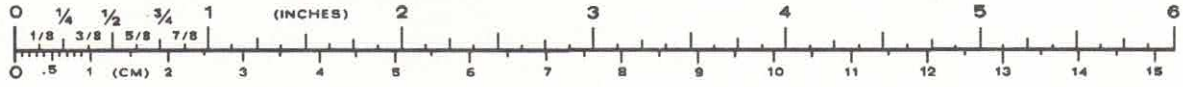
( ) Shock Hazard label (#235-840) onto the front of the DC/AC converter module.

( ) Ground label (#390-2975) onto the CRT as shown in the inset drawing.

( ) Safety/service reference label (#235-1139) around the 14" 75 Ω coaxial cable.

( ) Refer to Detail 2-7C to make sure that all of the cables and wires are positioned as shown and away from the TV Set's power resistors.

Except for the "Final Assembly," this completes the assembly of your 9" Portable Color TV Set. Proceed to "Initial Tests And Adjustments."



INITIAL TESTS AND ADJUSTMENTS

NORMAL OPERATING CHARACTERISTICS

When you first turn the TV Set on, and for several days later, you may hear occasional snapping (arcing) sounds. This arcing is normal, and may sometimes be quite loud. The arcing occurs between the elements of the picture tube during its initial aging process.

The TV Set will make a short squealing sound when you turn it on. This is normal and is produced by the horizontal deflection circuits.

INITIAL TESTS

PRIMARY WIRING TESTS

Refer to Pictorial 3-1 for the following steps.

NOTE: You will need an ohmmeter for the following tests. If one is not available, proceed to "Adjustments."

A wiring error in the primary wiring circuit (power cord, power supply assembly, etc.) of your kit could cause you to receive a severe electrical shock. These "Primary Wiring Tests" will help you check for any such errors that may exist. If you do not obtain the indicated results during these tests, proceed to "In Case Of Difficulty" on Page 65. Do not proceed with any further tests until you have located and corrected the problem.

The measurements in this section were taken with a VTVM (vacuum tube voltmeter) with a 1.5 volt resistance circuit potential. If you have a different type of meter, your readings may vary.

( ) Connect the AC power cord to the TV Set. Do not insert the AC power cord plug into an outlet at this time.

( ) Make sure the OFF/ON button is released (off).

( ) Set the ohmmeter to read 2 MΩ or greater.

( ) Connect the black (negative) ohmmeter lead to the VHF/UHF tuner's ground terminal. Leave this lead connected to this terminal until you are instructed to disconnect it.

( ) Touch the red (positive) ohmmeter lead to the wide power cord plug prong. The reading should be greater than 1 MΩ.

( ) Touch the red ohmmeter lead to the narrow power cord plug prong. The ohmmeter should indicate infinite.

( ) Disconnect the black (negative) ohmmeter lead from the VHF/UHF tuner's ground terminal.

( ) Touch the red (positive) ohmmeter lead to one power cord plug prong and the black lead to the other plug prong. The meter should indicate infinite.

(✓) Set the ohmmeter to read 10 kΩ.

(✓) Push the OFF/ON button to the in (ON) posi-tion. The reading should be greater than 20 kΩ.

(✓) Disconnect the ohmmeter leads and set the ohmmeter aside.

(✓) Release the OFF/ON button.

This completes the "Primary Wiring Tests."

ADJUSTMENTS

PREPARATION

Refer to Pictorial 3-2 for the following steps.

(✓) Refer to Detail 3-2A and cut off the ends of the alignment tool as shown. Bend the indicated end of the tool as shown. NOTE: Use the modified alignment tool to adjust the three controls on the video output module.

CAUTION: Make sure you do not touch any of the electrically "hot" heat sinks shown in inset drawing #6; otherwise, you will receive an electrical shock.

(✓) Rotate the tabs of the purity, 4-pole, and 6-pole magnets so they are together at the top of the CRT neck as shown in inset drawing #1.

(✓) On the crosshatch circuit board, set the NORMAL/CROSSHATCH switch to the NORMAL position as shown in inset drawing #7.

(✓) Using the straight end of the alignment tool, preset the G2 control on the main module to its center position.

(✓) On the main module, turn the PICTURE and COLOR LEVEL controls fully counterclockwise.

(✓) Set the BLACK LEVEL and SHARPNESS controls to their center (detent) position.

(✓) Set the TINT control to the center of its rotation.

(✓) On the video output module, turn the GREEN, RED, and BLUE controls fully counterclockwise (as viewed from the shaft end of the controls).

( ) If you have a 75 Ω antenna lead-in or cable TV system, connect the antenna lead-in directly to the 75 Ω antenna connector on the bracket assembly as shown in Part 1 of Detail 3-2B. If you have a 300 Ω VHF/UHF lead-in system, connect the antenna balun to the 75 Ω antenna connector as shown in Part 2 of Detail 3-2B. Then connect the lead-in wire to the terminals.

( ) Use a grease pencil or a similar marker to place a small dot (1/8" diameter maximum) in the center of the screen.

INITIAL OPERATION TESTS

WARNING: Extremely high voltage (18,000 volts) is present on the main module. Be very careful that you do not touch any of these module parts while the TV Set is in operation. A safe rule to remember when you work around high voltage is to use only one hand to work on the circuit and keep the other hand behind you. This helps prevent your body from becoming part of an electrical circuit from high voltage to ground.

If any sign of malfunctioning occurs in the following steps, turn the TV Set off and disconnect the power cord plug from the wall outlet. Then refer to the "In Case Of Difficulty" section on Page 63. Do not operate the TV Set until you have located and corrected the problem, since prolonged operation of a malfunctioning TV Set could result in damaged integrated circuits, transistors, picture tube, or other components.

(✓) Connect the socket end of the AC power cord to the back of the TV Set, if this has not already been done.

(✓) Insert the power cord plug into a 120 VAC outlet and push the front panel OFF/ON button to turn the TV Set on. The screen may or may not light up and there may or may not be sound present from the speaker. You should see the channel number in the lower left-hand corner of the cabinet front.

(4) Use the keyboard to select a station with a strong signal in your area. For example, push 2, 8, and ENTER, and channel 28 will be selected.

(5) Turn the PICTURE control clockwise to be sure that you have a moderately bright picture. The picture may or may not fill the screen at this time. Leave the control at this setting. If you do not have light on the screen, turn the BR (Black level Range) control clockwise until you do.

(6) Push the OFF/ON button to turn the TV Set off.

(7) Refer to inset drawing #2 and unplug the "Normal/Set-Up" shorting plug at 5L on the video output module, turn it 90° counterclockwise, and reinstall it.

(8) Push the OFF/ON button to turn the TV Set on.

CAUTION: A voltage potential is present on the horizontal output transistor heat sink (see inset drawing #6). **Do not touch it.**

(9) Use the alignment tool to turn the G2 control on the main module until the entire screen just lights up. Disregard any white diagonal lines on the screen. If the screen is predominantly one color, adjust the two controls on the video output module for the two missing colors to obtain a black and white screen.

(10) Push the OFF/ON button to turn the TV Set off.

(11) Unplug the "Normal/Set-Up" shorting plug at 5L, turn it 90° clockwise, and reinstall it.

(12) Push the OFF/ON button to turn the TV Set on.

(13) Select a strong TV station.

(14) Use the alignment tool to adjust the FOCUS control on the main module to make the picture as sharp as possible at the center of the screen.

(15) Push the VOL ▲ (Volume Up) button or the VOL ▼ (Volume Down) button and hold it until you obtain a comfortable listening level.

(16) Push the OFF/ON button to turn the TV Set off.

RASTER CENTERING

When you complete the "Convergence and Purity Adjustments," you should have:

1. A screen that is all one color with no discolorations.
2. The picture centered on the screen.
3. Straight crosshatch lines on the screen.

(1) Push the OFF/ON button to turn the TV Set on.

(2) Refer to inset drawing #7 and set the NORMAL/CROSSHATCH switch on the crosshatch generator circuit board to the CROSSHATCH position. NOTE: You must be receiving a strong signal from the antenna to obtain a stable crosshatch pattern.

(3) Adjust the CROSSHATCH control on the crosshatch generator circuit board for a visible pattern on the screen, but not too bright. If the display is not bright enough, turn the BLACK LEVEL control clockwise.

(4) Refer to Detail 3-2C and connect a shorting clip to the indicated lead of resistor R5117 on the video output module.

(5) **CAUTION**: In the following steps, **do not touch** any of the fine deflection yoke wires; otherwise, you may receive an RF burn.

(6) Carefully loosen the clamp screw on the deflection yoke and slide the yoke back as far as possible on the picture tube neck.

(7) If the lines on the screen are not horizontal and vertical, rotate the deflection yoke on the neck of the picture tube as necessary until they are. Then retighten the yoke clamp screw just enough to hold it in place.

(8) Adjust the HEIGHT control (R2172) on the main module until you can see both ends of the vertical crosshatch lines.

NOTE: Refer to inset drawing #4 for the location of the purity, 4- pole, and 6-pole magnets.

( ) Line up the round tabs of the purity magnets. Then rotate these magnets simultaneously, to observe how much of the ends of the horizontal lines are off the sides of the screen. Then adjust the tabs as best you can so each end of the lines are off the screen by the same amount. Also make sure the pattern is centered vertically. The purity ring tabs may end up in any final position around the neck of the picture tube. NOTE: You may not be able to see the ends of the horizontal lines. In that case, temporarily set the NORMAL/CROSS-HATCH switch to NORMAL and center the pattern as best you can.

4-POLE MAGNET ADJUSTMENT

( ) With the crosshatch pattern displayed, spread the tabs of the 4-pole magnets to converge the red and blue vertical lines at the center of the screen to obtain magenta (purple) lines.

( ) Rotate the 4-pole magnet tabs simultaneously around the neck of the picture tube to converge the horizontal lines at the center of the screen. NOTE: When you have these tabs correctly adjusted, they should be within the given 90° arc shown in inset drawing #5 in Pictorial 3-2. If you continue to adjust the tabs beyond the indicated 90° arc, you will get the same re-sponse that you got inside the 90° arc because the same process will again be repeated.

( ) Remove the shorting clip from resistor R5117; green lines may appear. NOTE: If these lines are converged already on top of the red and blue lines in the center of the screen, the lines will appear white.

( ) Store the shorting clip as shown in Pictorial 3-2. Keep the shorting clips in this position whenever you are not using them.

NOTE: If you were able to converge the vertical and horizontal lines at the center of the screen to obtain white linès in the center of the screen, skip the "6-pole Magnet Adjustment" and proceed to "Purity Adjustments."

6-POLE MAGNET ADJUSTMENT

( ) Spread the tabs of the 6-pole magnets to move the converged red and blue vertical lines on top of the green vertical lines to obtain white lines.

( ) Rotate both 6-pole magnet tabs simultaneously around the picture tube neck to converge the horizontal lines at the center of the screen. NOTE: When you have the tabs correctly adjusted, they should be within the given 60° arc shown in inset drawing #5 in the Pictorial. If you continue to adjust the tabs beyond the indicated 60° arc, you will get the same response that you got inside the 60° arc because the same process will again be repeated.

NOTE: Since there is some interaction between the 4- and 6-pole magnets, you may have to make slight readjustments to the 4-pole magnets to obtain the proper convergence.

PURITY ADJUSTMENTS

NOTES:

1. Be sure to turn the TV Set off **before** you attach a shorting clip to or remove it from a lead (or wire) on the video output module.

2. Refer to Detail 3-2C for the proper locations for connecting the shorting clips.

( ) Connect a shorting clip to the indicated lead of resistor R5116 on the video output module.

( ) Solder a 1/2" wire to the foil pad indicated in inset drawing #3 in Pictorial 3-2. Then attach the other shorting clip to the 1/2" wire.

( ) Refer to Photo A (fold-in) and adjust the tabs of the purity magnets until the screen exhibits all of the following characteristics:

   A. The raster (illuminated screen) is centered on the picture tube.

   B. The ends of the vertical lines are equal distances from the top and bottom of the picture tube mask opening.

C. The ends of the horizontal lines are equal distances beyond the sides of the picture tube mask opening. NOTE: The ends of these lines will be outside the mask opening.

D. The vertical line nearest the dot you placed in the center of the picture tube is pure green (with no other color shading). Do not try to center the entire green area over the dot.

( ) Loosen the yoke clamp screw and push the deflection yoke all the way forward until it is against the picture tube bell.

( ) Remove the shorting clip from resistor R5116 and reconnect it to the indicated lead of resistor R5117.

( ) Slowly pull the deflection yoke back until the screen has pure red lines as shown in Photo B (fold-in).

( ) Set the NORMAL/CROSSHATCH switch on the crosshatch generator circuit board to NORMAL and check the picture to make sure it is pure red. Then return the switch to CROSSHATCH. If the lines or picture are not pure red, readjust the deflection yoke or purity magnet tabs slightly until they are.

( ) Rotate the deflection yoke as necessary to straighten the crosshatch pattern. Then tighten the yoke clamp screw to hold the yoke securely to the picture tube neck.

( ) Remove the shorting clip from resistor R5117 and reconnect it to resistor R5116. The screen should have all green lines. Remove the shorting clip from resistor R5115 and reconnect it to resistor R5117. The screen should have all blue lines. Readjust the purity magnet tabs very slightly, if necessary, to obtain pure color lines.

( ) Remove the shorting clip from resistor R5116 and red and blue (magenta) lines should appear on the screen.

STATIC CONVERGENCE

( ) Readjust the FOCUS control on the main module to make the lines as sharp as possible at the center of the screen.

( ) **Spread apart** or **squeeze together** the 4-pole magnet tabs to converge the red and blue **vertical** lines at the **center** of the screen.

( ) **Rotate** both 4-pole magnet tabs simultaneously around the picture tube neck to converge the **horizontal** lines at the **center** of the screen. NOTE: When you have these tabs correctly adjusted, they should be within the given 90° arc shown in inset drawing #5 in Pictorial 3-2.

( ) Remove the shorting clip from resistor R5117.

( ) **Spread apart** or **squeeze together** the tabs of the 6-pole magnet to move the converged red and blue vertical lines over the green vertical lines to obtain white vertical lines.

( ) Rotate both tabs simultaneously around the picture tube neck to converge the horizontal lines at the center of the screen. NOTE: When these tabs are correctly adjusted, they should be within the given 60° arc shown in inset drawing #5 in Pictorial 3-2.

( ) Set the NORMAL/CROSSHATCH switch on the crosshatch generator circuit board to the NORMAL position.

( ) Readjust the PICTURE and BLACK LEVEL controls, if necessary, until you can see a picture on the screen.

( ) Adjust the HEIGHT control on the main module until the top and bottom edge of the picture just disappear behind the mask.

( ) Set the NORMAL/CROSSHATCH switch on the crosshatch generator circuit board to the CROSSHATCH position.

DYNAMIC CONVERGENCE

NOTE: Perfect convergence over the entire screen is not normally possible. Perform the adjustments in the following steps for the best compromise in the top/bottom and left/right areas of the picture.

( ) Connect a shorting clip to the indicated lead of resistor R5117.

( ) Locate the three rubber wedges (#235-1146) and three pieces of double-stick tape.

( ) Refer to inset drawing #1 in Detail 3-3A and cut each piece of tape to a width of 3/8".

( ) Remove the backing paper from one side only of a double-stick tape; then refer to inset drawing #2 in Detail 3-3A and firmly apply the tape to a rubber wedge as shown.

( ) Similarly, apply a piece of tape to each of the remaining two rubber wedges.

CAUTION: If you received a deflection yoke wherre terminals and/or wire ends are exposed, avoid touching these items when you perfomr the following steps. Otherwise, you may receive a light electrical shock.

( ) Remove the backing paper from a rubber wedge. Then, while you hold the front portion (plastic or metal) of the deflection yoke, tilt the yoke vertically and converge the ends of the center lines as shown in Pictorial 3-3. Hold the yoke in this position and carefully insert the rubber wedge between the yoke and the picture tube until it is firmly in place as shown in Detail 3-3A. Press the wedge against the tube so it adheres firmly without disturbing the yoke position. Check to make sure the lines are still con-verged at the ends.

( ) Remove the backing paper from another rubber wedge. Then, while you hold the front portion (plastic or metal) of the deflection yoke, tilt the yoke horizontally and converge the red and blue lines at both sides as shown in Pictorial 3-4. Hold the yoke at this position and carefully insert the rubber wedge between the yoke and the picture tube approximately 90° from the top wedge until it is firmly in place as shown in Detail 3-4A. Press the wedge against the tube so it adheres firmly. Do not disturb the yoke position. Check to make sure the red and blue lines are still converged at the ends.

( ) Remove the backing paper from the remaining rubber wedge and carefully insert it between the deflection yoke and the picture tube at approximately 180° from the previously installed wedge as shown in Detail 3-4A.

( ) Remove the shorting clip from resistor R5117 and reconnect it to the storage position.

BLACK AND WHITE TRACKING

( ) Set the NORMAL/CROSSHATCH switch on the crosshatch generator circuit board to the NORMAL position.

( ) Adjust the PICTURE control for a normal picture on the screen. Make sure the COLOR LEVEL control is turned fully counterclockwise.

( ) Using the alignment tool, set the red, green, and blue tracking controls, R5113, R5114, and R5112 on the video output module fully counterclockwise (if this has not already been done).

( ) Note the color of the picture on the screen. Then adjust the two controls of the two missing colors to produce a black and white picture. (Example: If the picture is red, adjust the GREEN and BLUE controls.)

BLACK LEVEL RANGE

Refer to Pictorial 3-2 for the following steps.

( ) Turn the PICTURE and COLOR LEVEL controls fully counterclockwise, if this has not already been done.

( ) Turn the BLACK LEVEL control to its center (detent) position, if this has not already been done.

( ) Adjust the BR (Black level Range) control clockwise until you just have light on the screen.

AGC DELAY

Refer to Pictorial 3-2 for the following steps.

( ) Select the strongest channel in your area.

( ) Adjust the PICTURE control for a normal picture.

( ) Refer to inset drawing #8 in Pictorial 3-2 and adjust AGC Delay control R1231 on the main module clockwise until the picture is snowy. Then adjust the control back until the snow disappears. If there is a channel 6 operating in your area, tune to this channel and adjust the AGC Delay control for minimum "beat" (interfering bars or lines) in the picture.

NOTE: When you are using a signal source other than a TV station (video game, video cassette recorder, etc.) with this TV Set, you may have to readjust the AGC Delay control.

COLOR LEVEL

Refer to Pictorial 3-2 and the color photographs (fold-in) for the following steps.

( ) Select a strong TV station.

( ) Turn the Color Level control clockwise for the desired amount of color in the picture. If the colors appear faded or weak, turn the Color Level control clockwise. If the colors appear vivid or intense (see Photo C of the fold-in), turn the control counterclockwise.

TINT

Refer to Pictorial 3-2 and the color photographs (fold-in) for the following steps.

( ) Select a strong TV station.

( ) If the flesh tones in the picture appear purple (see Photo D of the fold-in), turn the Tint control clockwise. If the flesh tones appear green (see Photo E of the fold-in), turn the control counterclockwise.

( ) Push the OFF/ON button to turn the TV Set off. Disconnect the power cord plug from the AC outlet.

( ) If it has been installed, remove the antenna balun from the rear of the TV Set and set it aside.

( ) Use a soft cloth to remove the dot from the center of the picture tube.

( ) Disconnect the power cord from the TV Set.

This completes the "Initial Tests and Adjustments." Proceed to "Final Assembly."

FINAL ASSEMBLY

Refer to Pictorial 4-1 for the following steps.

( ) Refer to Part A of Pictorial 4-1 and position the cabinet back as shown.

Separate the two sections of the bilingual warning label (#235-1140). Then one at a time, install the labels in the following steps. Carefully peel the backing paper from each label and press the label onto the inside of the cabinet back as the step directs you and as shown in Part A of the Pictorial.

( ) French version of the bilingual warning label onto the indicated left-side area.

( ) English version of the bilingual warning label onto the indicated right-side area.

( ) CRT identification label (#235-1138) onto the indicated right-side area.

( ) Locate the handle and notice that its top surface is rounded at one end. Position the handle so the rounded end is towards the rear of the cabinet back as shown. Then insert the handle's mounting bolts into the corresponding holes in the cabinet back.

( ) Making sure the handle does not fall out, turn the cabinet back upside down as shown in Part B of Pictorial 4-1. Then place the handle support bracket over the handle bolts and secure the bracket with a 10-32 locknut at each of the two mounting locations.

( ) Disconnect the two wires from the speaker and position the speaker mounting bracket/speaker assembly as shown. Then slide the assembly all the way into the grooves at the indicated location inside the cabinet back. Secure the assembly to the cabinet back with a #8 x 5/8" screw.

Refer to Pictorial 4-2 for the following steps.

Install each of the following labels by, first, carefully peeling the backing paper from it. Then press the label in place on the outside cabinet back area as shown in the Pictorial.

( ) Blue and white label. NOTE: Refer to the Series and Model numbers on this label in any correspondence you have with the Heath Company about this kit.

( ) Model/Power consumption label (#390-3012).

( ) Manufacturing date label (#390-1192).

( ) Remove the backing paper from the cable retainer. Then, with its opening facing up, press the retainer in place on the cabinet back at the location shown in the Pictorial.

( ) Make sure the antenna assembly is fully collapsed. Position the base of the assembly over the indicated hole as shown; then firmly push the base into the hole until it locks into place.

( ) Swivel the metal portion (top) of the collapsed antenna towards the antenna retainer. Pull the top metal section of the antenna out about 1/16". Then secure the antenna to the retainer by pushing it firmly down.

( ) Position the cabinet back next to the cabinet front/cabinet bottom assembly as shown in Part A of the Pictorial.

Refer to Part A of Pictorial 4-2 and connect the free ends of the wires coming from the audio transformer to the speaker as follows:

( ) White/brown wire to lug 1.

( ) Brown wire to lug 2.

( ) Position the cabinet front/cabinet bottom assembly so it rests on the CRT face as shown in Part B of the Pictorial.

( ) Carefully lower the cabinet back onto the cabinet front/cabinet bottom assembly so the lips of the cabinet back fit inside their slots properly. When the cabinet back is in place, make sure that none of the wires are pinched.

( ) Secure the cabinet back to the antenna bracket assembly with two #8 x 7/16" screws.

( ) Secure the cabinet back to the DC/AC converter module with a #8 x 7/16" screw.

( ) Secure the cabinet bottom to the cabinet back with two #8 x 19/32" flat-head screws.

( ) Secure the cabinet back to the cabinet front mounting brackets with two #8 x 3/8" screws.

( ) Connect the socket end of the appropriate power cord (AC or DC) to the corresponding receptacle on the back of the TV Set.

( ) Route the power cord through the cable retainer; then close the retainer to secure the cord.

( ) Place the TV Set in its upright position.

This completes the "Final Assembly." Proceed to "Antennas."

ANTENNAS

The information in this section of the Manual will help you select the proper antenna so you can get the maximum performance from your Television Set. It includes information concerning antennas, antenna lead-ins (twin-lead and coaxial cable), proper antenna orientation, and signal preamplifiers for fringe areas.

We suggest that you use a broadband antenna, such as one of the types recommended for color TV reception, with your 9" Portable Color TV Set. It is very important that you use an antenna that is suited for your area. Some indoor and outdoor antennas that are used satisfactorily for black and white TV reception do not provide sufficient signal strength and bandwidth for color television. The impedance of the antenna and the lead-in can be either 300 Ω or 75 Ω.

Refer to Pictorial 5-1 for the following description.

The "F" connector on the back of the TV Set has an impedance of 75 Ω. If the lead-in coming from your antenna is 75 Ω, you can connect the cable directly to the connector as shown in Part 1 of Pictorial 5-1. If the lead-in coming from your antenna is 300 Ω, you must use the 300 Ω to 75 Ω matching transformer supplied with your TV Set as shown in Part 2 of Pictorial 5-1. The 300 Ω twin lead is then connected to the balun terminal screws.

CATV AND MATV SYSTEMS

The CATV (cable TV) antenna connection shown in Pictorial 5-1 Part 1 uses 75 Ω coaxial cable and requires no matching transformer. Connect the cable directly to the "F" connector on the TV Set.

The MATV (master antenna TV) systems used in motels, hotels, and trailer parks are similar to the CATV system, and use the same antenna connector on the TV Set.

For best reception on VHF TV Channels 2 through 13, fully extend the telescoping monopole antenna. Rotate the base of the antenna in a circular pattern for the best picture.

For UHF TV channels 14 through 69, collapse and rotate the antenna in such a manner that you obtain the best reception possible on the desired channel.

The UHF stations in CATV and MATV systems are converted to unused VHF channels; therefore, UHF antenna connections are not used. Master antenna systems used in motels, hotels, and trailer parks are similar and use the same antenna connections.

INDOOR ANTENNAS

Refer to Pictorial 5-1 Parts 2 and 3 while you read the following information.

To install the balun assembly, perform the following steps:

1. Refer to Pictorial 5-1 Part 2 and attach the antenna wire to the 300 Ω to 75 Ω balun assembly supplied with your TV Set. Loosen both balun assembly screws, slide the antenna wire spade lug under one of the screw heads, and retighten the screw. Similarly, attach the spade lug of the wire coming from the TV Set's antenna panel under the other screw and tighten the screw.

2. Push the balun assembly onto the "F" connector socket on the TV Set's antenna panel as shown.

NOTE: When you use a table top or outdoor antenna, the connector wire coming from the TV Set's antenna panel is not used.

ANTENNA LEAD-INS

Color television signals are carried from the antenna to the TV Set by 300 Ω twin lead or 75 Ω coaxial cable. The most commonly used types of twin lead and cable are listed below, with a description of how they respond to weather conditions.

300 Ω Flat Twin Lead — Little signal loss in fair weather. High signal loss in wet weather, especially on UHF channels.

300 Ω Tubular Twin Lead — Little signal loss in fair weather. Less signal loss in wet weather than with flat twin lead. Better for UHF reception than flat twin lead.

The signal loss may be even greater with twin lead if it has accumulated a noticeable amount of foreign matter (dirt, chimney soot, etc.). Do not route twin-lead inside a metal pipe or within five inches of any metal surface. The insulation also ages from the weather and develops minute cracks.

75 Ω Low-Loss Coaxial Cable — Slightly more signal loss in fair weather than with twin lead. However, it has the following advantages over twin lead: No additional signal loss in wet weather, less affected by local interference, lasts much longer, no stand-off insulators needed to keep it away from antenna tower or pole and, if needed, can be routed inside a metal pipe. Excellent for TV reception (color or black and white) and stereo FM reception.

When you use 75 Ω cable, you should also use a 75 Ω antenna. If you have a single, all channel, 75 Ω lead-in, connect it as shown in Pictorial 5-1 Part 1.

68 Channel 300 Ω — This single lead-in requires a signal splitter and is connected as shown in Pictorial 5-1 Part 2.

ANTENNA ORIENTATION

Antennas require more careful orientation for good color TV reception than for black and white TV. Some antenna positions may result in good black and white pictures, but poor color pictures. This is mainly because the color information is transmitted differently than the black and white information. If a new antenna is being installed, or if the position of an older antenna seems questionable, orient it while you view a color program for best reception.

If the antenna is not oriented properly, signals from several directions may be reaching the antenna at the same time. These signals are usually reflected from objects such as large buildings or large metal structures. The reflected signals may cause slight phase shifts in the TV signal. On black and white pictures, this would result in a very slight ghost (a duplicate image appearing next to the actual image) or smear. On color pictures, however, the phase shift can cause excessive color smear, ghosting and incorrect color areas. To eliminate this problem, rotate the antenna until you get the best picture.

Distorted pictures can sometimes be caused by too strong a signal, especially in metropolitan areas, where the transmitting antenna is close to the receiving antenna. In this case, you can reduce the signal from the antenna by using an attenuator pad. Pictorial 5-2 shows two types of attenuator pads, one for 75 Ω impedance lead-in and one for 300 Ω impedance lead-in. Select the correct pad for your lead-in and connect it between the antenna and the TV Set as shown. You can obtain the resistors to make these pads from any local electronic parts store.

SIGNAL PREAMPLIFIERS

If you live in a fringe area where it is difficult to receive a strong TV signal, a preamplifier may be the solution to your problem. A preamplifier will amplify the weak signal received by the antenna. If you purchase a unit of this type, make sure the specifications allow it to be used for color as well as black and white signals. If the bandpass specifications are too narrow, a phase shift could occur, which could cause color smear and incorrect color areas on the screen, where a black and white picture would not be affected.

There are two types of preamplifiers, outdoor and indoor.

The **outdoor** preamplifier is mounted on the antenna mast near the antenna. The antenna is connected to the input terminals and the lead-in is connected to the output terminals. The other end of the lead-in is connected through the preamplifier power supply to the television antenna terminals. The power supply which supplies operating voltages for the preamplifier is mounted in the house, and the voltages are fed to the preamplifier through the lead-in.

The main advantage of using an outdoor preamplifier of this type is that only the TV signal from the antenna is amplified and not the noise picked up by the lead-in. This gives a better signal-to-noise ratio and less snow in the picture. In addition, very weak signals are amplified before they become attenuated by inherent line losses in the lead-in cable.

The **indoor** preamplifier is installed inside the house between the antenna and TV set. This unit amplifies the signal as well as an outdoor unit; however, any noise picked up in the lead-in is also amplified.

The indoor preamplifier is a good unit to use when more than one TV Set is connected. You can usually purchase this type of unit with more than one set of output terminals. Additional TV sets can be connected to these terminals. This serves as an amplifier stage for each TV set, and also provides isolation to keep the sets from interfering with each other.

When you use a preamplifier as a multi-set coupler in strong signal areas, the input of the preamplifier (depending on the circuitry) may be overdriven. This would result in cross-modulation problems in the preamplifier, and cause interference on one or more channels. In these cases, be sure to use an attenuator pad, such as the one shown in Pictorial 5-2, at the input of the preamplifier to reduce the amount of signal to the preamplifier.

NOTE: Many preamplifiers are more susceptible to interference than the TV receiver because of their broad-band input. If your TV picture has interference, disconnect the preamplifier and check the reception without it. If this eliminates the interference, you can use an appropriate filter in the lead-in going to the preamplifier from the antenna. Do not overlook the possibility that a strong FM station could also be causing the interference.

OPERATION

NOTE: Be sure to read the "Television Safety Guide" before you operate your TV Set.

GENERAL

SELECTING THE LOCATION

Place your TV Set where sunlight or bright light will not fall directly on the screen. Allow a comfortable viewing distance, usually four feet or more.

Be sure the location has an accessible antenna system. A strong signal is necessary to obtain the best possible color picture. (See "Antennas," Page 45.)

POWER SOURCE

Your TV Set is designed to operate on standard 120 volt, 60 Hz AC voltage or on automobile 12-volt DC voltage with a negative ground connection.

SPECIAL PRECAUTIONS

Do not place antenna rotator controls, electric clocks, telephones, etc., on top of your Color TV Set. These devices can produce undesirable magnetic effects that can distort the colors on the picture tube.

If you use your TV Set to play video games, do not adjust the PICTURE control for an excessively bright game display. To do so over a long period of time could permanently imprint the display on the picture tube. To reduce this possibility, alternate your use of the game with normal TV viewing. Always turn the game off promptly when you are finished using it.

If you do not intend to use the TV Set for a long period of time (such as during a vacation), unplug the power cord for added protection against possible damage from lightning or power surges. In addition, if your TV Set is connected to an outside antenna, disconnect the lead-in wire at the antenna connector on the back of the TV Set.

CABINET FRONT CONTROLS

Refer to Pictorial 6-1 for the location of the following front controls.

The following paragraphs describe the action of each switch and, where applicable, its interaction with other controls and/or switches. For the best results, make sure you understand each of the switch functions.

OFF/ON button — Turns the TV Set on and off.

VOL ▲ (Volume Up) button — Increases the volume as long as the button is pressed. Continued pressure will increase the volume to its maximum level.

VOL ▼ (Volume Down) button — Decreases the volume as long as the button is pressed. Continued pressure will decrease the volume to its minimum level.

CH ▲ (Channel Up) button — "Up-scans" the programmed channels in their lower-to-higher numbered sequence. This process will continue as long as the button is pressed.

CH ▼ (Channel Down) button — "Down-scans" the programmed channels in their higher-to-lower numbered sequence. This process will continue as long as the button is pressed.

0 — 9 channel buttons — Select the desired channel. To select a channel, press the numbered button(s) that match the desired channel number. The channel number will appear in the display window after you press a button. After a short delay, that station will appear on the screen. If you desire the station to appear on the screen without the short delay, press the desired channel number button(s) and then the ENTER button.

NOTE: Whenever you select a two- or three-digit number, enter the second digit within two seconds or the tuner control will assume that two single channels have been selected and the TV Set's screen will display the latest number you entered. When you select channels without using the ENTER button, the channels will not be stored in memory for future recall.

ENTER button — This button, and the 0 through 9 buttons, will select a channel immediately without a delay. In addition, whenever you select a channel and press the ENTER button, that channel number is automatically entered into the tuner control memory.

SKIP* button — Allows you to skip or program out a channel from the scan sequence. Use the following procedure:

1. Press the numbered button(s) to select the channel you wish to skip. Then press the SKIP button to remove the channel from the TV Set's memory. The letters PO (programmed out) will appear briefly in the display window, followed by the channel number you programmed out.

2. Repeat the first step for any other channels that you wish to skip.

NOTE: You can reprogram any channel that was programmed out by following the instructions under the previous section entitled "Enter."

AFC* (Automatic Frequency Control) button — Refer to Table 6-1 on Page 51 for the correct setting of this button. Normally, you will select the FIXED mode. If the signals that your TV Set is receiving vary from FCC standard frequencies, you may get poor reception or no picture. This condition is most prevalent when you use CATV (cable) and MATV (master antenna), or some types of video games. If you experience poor reception when you use one of these sources, push the button once to display the current mode; then push the button a second time for the SEARCH mode and recheck your reception. Your selection will appear in the display window as "F" or "S". In the SEARCH position, the TV Set will take longer to select a station (about one second) than in the FIXED position.

*NOTE: The Skip (channels), Band Selector, and AFC buttons are flush-mounted to prevent accidental activation.

BAND SELECTOR* button — Refer to Table 6-1 for the correct setting of this button. In the three CATV positions, the TV Set is capable of receiving the special cable TV channels that are located between the ordinary broadcast TV channels.

To change bands, press the Band Selector button once. The band currently selected will appear in the display window. Press the button again; the next band will then be selected and appear in the display window, and so on. Your selection will appear in the display window as "b" for b'cast (broadcast), "c" for catv (cable television), "h" for hrc (harmonically related carriers), or "I" for irc (incremental coherent carriers).

CATV channels are designated by the cable TV industry as channels 2 through 13, A-8 (4+), A-2, A-1, A through W, AA through ZZ, and AAA, BBB, and ultraband channels 65 through 120. Therefore, to select the lettered channels, you must translate them to a numbered channel. Table 6-2 on Page 53 is provided so you can easily keep track of the cable TV channels, which are provided by your CATV company. Refer to the "Television Broadcast Channels" charts on Pages 54 through 62 for additional information.

Table 6-1

For TV Signals from a/an:	BAND Switch Button	AFC Switch Button
Indoor or outdoor antenna	Broadcast	Fixed
Cable antenna	CATV	Fixed or Search
Cable antenna (HRC) System	HRC	Fixed or Search
Cable antenna (ICC) System	ICC	Fixed or Search
Master antenna (MATV) System	Broadcast	Fixed or Search
Video game	Broadcast	Search

CABINET SIDE CONTROLS

PICTURE control — Adjusts the picture brightness to the desired level. This control automatically adjusts the contrast and color level to the proper balance.

BLACK LEVEL control — Sets the black areas of the picture to the desired level. Once you have this control properly set, an electronic contrast regulator automatically maintains this preset black level from scene to scene. Use the PICTURE control to make any further brightness adjustments. The "normal" position is the center or detent position.

TINT control — Adjusts the picture for the most natural flesh tones. If the flesh tones appear purple (see Photo D, fold-in sheet), turn the control clockwise. If the flesh tones appear green (see Photo E), turn the control counterclockwise.

COLOR LEVEL control — Changes the intensity of the colors. If the colors appear faded or weak, turn the control clockwise. If the colors appear vivid or intense (see Photo C, fold-in sheet), turn the control counterclockwise.

SHARPNESS control — Use this control to adjust the detail in the picture. Turn the control counterclockwise for a softer picture. For more detail, turn the control clockwise. If this control is advanced too far, the picture will look grainy or noisy. Normal setting is the center or detent position.

AUDIO OUTPUT/EARPHONE JACK — The dual-purpose audio output/earphone jack is used to connect the private listening earphone supplied with your TV Set. When the earphone is plugged in, the TV speaker is disconnected. This permits you to enjoy TV programs without disturbing others in the area. CAUTION: When you use the earphone, we suggest that you set the volume of the TV Set at a low level before putting the earphone in your ear. Then adjust the volume to a comfortable listening level.

You may wish to listen to your TV Set through your own high fidelity sound system. The jack allows you to connect the audio signal of the TV Set to the auxiliary input of your hi-fi sound system amplifier. The TV Set's internal speaker will be disconnected when you make this connection.

CABINET BACK CONNECTIONS

Power Cords — Two power cords are supplied with your TV Set; one is for AC operation and the other is for DC operation.

The AC Power Cord has a 5-pin connector at one end which plugs into the receptacle on the back of the TV; the other end has a polarized wall plug with one regular prong and one wider prong. If the prongs do not fit into your wall receptacle either way, you have an old, nonstandard outlet; therefore, you should have a qualified electrician install a new one. Always plug the 5-pin connector into the receptacle on the back of the TV Set before you plug the polarized wall plug into the AC power outlet.

The DC Power Cord has a 5-pin connector on one end which plugs into the receptacle on the back of the TV Set; the other end has a round cigarette lighter-type plug which you can insert into the car or camper's cigarette lighter. Always plug the 5-pin connector into the TV Set before you plug the cigarette lighter-type plug into the car or camper's lighter socket.

The DC power cord has a 10-ampere, type 3AG, fuse housed inside the cigar lighter-type plug. To replace the fuse, unscrew the tip of this plug.

Antenna Connector – This connector accepts an "F"-type plug (used with a 75 Ω coaxial antenna cable) or the plug end of the balun assembly provided with your TV Set (used with a 300 Ω lead-in).

SUN SCREEN

Refer to Pictorial 6-2 for the following steps.

( ) Your TV Set has a sun screen which will reduce glare when you operate the TV Set in bright light. Before you use the sun screen, peel off the protective film.

( ) To attach the sun screen to your TV Set, line up the sun screen's molded tabs with the locator notches above the TV screen. Insert the tabs into the notches and press the molded locking spring clips on the bottom of the sun screen upwards, out of the way. Then gently press the sun screen into place.

( ) To remove the sun screen, use a plastic credit card or some other nonmetallic card, such as a playing card, and insert the card in the seam below the bottom center of the sun screen as shown.

( ) Move the card to the right to release the molded locking spring clip which holds the lower right side of the screen in place. As you do, exert a slight outward pull on the lower side of the screen to slightly "pop out" the lower right corner.

( ) Move the card to the left to release the molded locking spring clip which holds the lower left side of the screen in place. As you do, exert a slight outward pull on the lower left side of the screen to slightly "pop out" the lower left corner.

( ) Grasp the slightly protruding lower corners of the sun screen with your fingertips and exert a slight downward pressure to release the upper tabs from the slots and remove the sun screen.

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CABLE TV CHANNEL REFERENCE CHART

CATV (Low- and High-Band) Channel.	2	3	4	A-8 (4+)	5	6	7	8	9	10	11	12	13
Select Channel Number	2	3	4	00	5	6	7	8	9	10	11	12	13
Actual TV Station**	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

CATV (Mid-Band) Channel.	A-2	A-1	A	B	C	D	E	F	G	H	I		
Select Channel Number	0	1	14	15	16	17	18	19	20	21	22		
Actual TV Station**	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐		

CATV (Super-Band) Channel.	J	K	L	M	N	O	P	Q	R	S	T	U	V	W
Select Channel Number	23	24	25	26	27	28	29	30	31	32	33	34	35	36
Actual TV Station**	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

CATV (Hyper-Band) Channel.	AA	BB	CC	DD	EE	FF	GG	HH	II	JJ	KK	LL	MM	NN
Select Channel Number	37	38	39	40	41	42	43	44	45	46	47	48	49	50
Actual TV Station**	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
	OO	PP	QQ	RR	SS	TT	UU	VV	WW	XX	YY	ZZ	AAA	BBB
	51	52	53	54	55	56	57	58	59	60	61	62	63	64
	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

CATV (Ultra-Band) Channel.														
Select Channel Number	65	66	67	68	69	70	71	72	73	74	75	76	77	78
Actual TV Station**	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
	79	80	81	82	83	84	85	86	87	88	89	90	91	92
	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
	93	94	95	96	97	98	99	100	101	102	103	104	105	106
	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
	107	108	109	110	111	112	113	114	115	116	117	118	119	120
	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

** Write in the actual station name or channel number information supplied by your cable TV (CATV) company.

Table 6-2

TELEVISION BROADCAST CHANNELS

VHF FREQUENCY CHART

CHANNEL NUMBER	FREQUENCY LIMITS (MHz)	VIDEO CARRIER FREQUENCY (MHz)	AUDIO CARRIER FREQUENCY (MHz)	OSC. FREQ. (MHz)
2	54 - 60	55.25	59.75	101
3	60 - 66	61.25	65.75	107
4	66 - 72	67.25	71.75	113
5	76 - 82	77.25	81.75	123
6	82 - 88	83.25	87.75	129
7	174 - 180	175.25	179.75	221
8	180 - 186	181.25	185.75	227
9	186 - 192	187.25	191.75	233
10	192 - 198	193.25	197.75	239
11	198 - 204	199.25	203.75	245
12	204 - 210	205.25	209.75	251
13	210 - 216	211.25	215.75	257

UHF FREQUENCY CHART

CHANNEL NUMBER	FREQUENCY LIMITS (MHz)	VIDEO CARRIER FREQUENCY (MHz)	AUDIO CARRIER FREQUENCY (MHz)	OSC. FREQ. (MHz)
14	470 - 476	471.25	475.75	517
15	476 - 482	477.25	481.75	523
16	482 - 488	483.25	487.75	529
17	488 - 494	489.25	493.75	535
18	494 - 500	495.25	499.75	541
19	500 - 506	501.25	505.75	547
20	506 - 512	507.25	511.75	553
21	512 - 518	513.25	517.75	559
22	518 - 524	519.25	523.75	565
23	524 - 530	525.25	529.75	571
24	530 - 536	531.25	535.75	577
25	536 - 542	537.25	541.75	583
26	542 - 548	543.25	547.75	589
27	548 - 554	549.25	553.75	595

UHF FREQUENCY CHART (Cont'd.)

CHANNEL NUMBER	FREQUENCY LIMITS (MHz)	VIDEO CARRIER FREQUENCY (MHz)	AUDIO CARRIER FREQUENCY (MHz)	OSC. FREQ. (MHz)
28	554 - 560	555.25	559.75	601
29	560 - 566	561.25	565.75	607
30	566 - 572	567.25	571.75	613
31	572 - 578	573.25	577.75	619
32	578 - 584	579.25	583.75	625
33	584 - 590	585.25	589.75	631
34	590 - 596	591.25	595.75	637
35	596 - 602	597.25	601.75	643
36	602 - 608	603.25	607.75	649
37	608 - 614	609.25	613.75	655
38	614 - 620	615.25	619.75	661
39	620 - 626	621.25	625.75	667
40	626 - 632	627.25	631.75	673
41	632 - 638	633.25	637.75	679
42	638 - 644	639.25	643.75	685
43	644 - 650	645.25	649.75	691
44	650 - 656	651.25	655.75	697
45	656 - 662	657.25	661.75	703
46	662 - 668	663.25	667.75	709
47	668 - 674	669.25	673.75	715
48	674 - 680	675.25	679.75	721
49	680 - 686	681.25	685.75	727
50	686 - 692	687.25	691.75	733
51	692 - 698	693.25	697.75	739
52	698 - 704	699.25	703.75	745
53	704 - 710	705.25	709.75	751
54	710 - 716	711.25	715.75	757
55	716 - 722	717.25	721.75	763
56	722 - 728	723.25	727.75	769
57	728 - 734	729.25	733.75	775
58	734 - 740	735.25	739.75	781
59	740 - 746	741.25	745.75	787
60	746 - 752	747.25	751.75	793
61	752 - 758	753.25	757.75	799
62	758 - 764	759.25	763.75	805
63	764 - 770	765.25	769.75	811
64	770 - 776	771.25	775.75	817
65	776 - 782	777.25	781.75	823
66	782 - 788	783.25	787.75	829
67	788 - 794	789.25	793.75	835
68	794 - 800	795.25	799.75	841
69	800 - 806	801.25	805.75	847

NOTE: UHF channels 70 through 83 are no longer available.

CATV CHANNELS

CATV LOW-, MID-, AND HIGH-BAND FREQUENCY CHART

CHANNEL NUMBER	FREQUENCY LIMITS (MHz)	VIDEO CARRIER FREQUENCY (MHz)	AUDIO CARRIER FREQUENCY (MHz)	OSC. FREQ. (MHz)	CHANNEL INDICATOR
		Low-Band			
2	54 - 60	55.25	59.75	101	2
3	60 - 66	61.25	65.75	107	3
4	66 - 72	67.25	71.75	113	4
A-8(4+)	70.75 - 76.75	72.00	76.50	117.75	00
5	76 - 82	77.25	81.75	123	5
6	82 - 88	83.25	87.75	129	6
		Mid-Band			
A-2	108 - 114	109.25	113.75	155	0
A-1	114 - 120	115.25	119.75	161	1
A	120 - 126	121.25	125.75	167	14
B	126 - 132	127.25	131.75	173	15
C	132 - 138	133.25	137.75	179	16
D	138 - 144	139.25	143.75	185	17
E	144 - 150	145.25	149.75	191	18
F	150 - 156	151.25	155.75	197	19
G	156 - 162	157.25	161.75	203	20
H	162 - 168	163.25	167.75	209	21
I	168 - 174	169.25	173.75	215	22
		High-Band			
7	174 - 180	175.25	179.75	221	7
8	180 - 186	181.25	185.75	227	8
9	186 - 192	187.25	191.75	233	9
10	192 - 198	193.25	197.75	239	10
11	198 - 204	199.25	203.75	245	11
12	204 - 210	205.25	209.75	251	12
13	210 - 216	211.25	215.75	257	13

CATV SUPER- AND HYPER-BAND FREQUENCY CHART

CHANNEL NUMBER	FREQUENCY LIMITS (MHz)	VIDEO CARRIER FREQUENCY (MHz)	AUDIO CARRIER FREQUENCY (MHz)	OSC. FREQ. (MHz)	CHANNEL INDICATOR
		Super-Band			
J	216 - 222	217.25	221.75	263	23
K	222 - 228	223.25	227.75	269	24
L	228 - 234	229.25	233.75	275	25
M	234 - 240	235.25	239.75	281	26
N	240 - 246	241.25	245.75	287	27
O	246 - 252	247.25	251.75	293	28
P	252 - 258	253.25	257.75	299	29
Q	258 - 264	259.25	263.75	305	30
R	264 - 270	265.25	269.75	311	31
S	270 - 276	271.25	275.75	317	32
T	276 - 282	277.25	281.75	323	33
U	282 - 288	283.25	287.75	329	34
V	288 - 294	289.25	293.75	335	35
W	294 - 300	295.25	298.83	341	36
		Hyper-Band			
AA	300 - 306	301.25	305.75	347	37
BB	306 - 312	307.25	311.75	353	38
CC	312 - 318	313.25	317.75	359	39
DD	318 - 324	319.25	323.75	365	40
EE	324 - 330	325.25	329.75	371	41
FF	330 - 336	331.25	335.75	377	42
GG	336 - 342	337.25	341.75	383	43
HH	342 - 348	343.25	347.75	389	44
II	348 - 354	349.25	353.75	395	45
JJ	354 - 360	355.25	359.75	401	46
KK	360 - 366	361.25	365.75	407	47
LL	366 - 372	367.25	371.75	413	48
MM	372 - 378	373.25	377.75	419	49
NN	378 - 384	379.25	383.75	425	50
OO	384 - 390	385.25	389.75	431	51
PP	390 - 396	391.25	395.75	437	52
QQ	396 - 402	397.25	401.75	443	53
RR	402 - 408	403.25	407.75	449	54
SS	408 - 414	409.25	413.75	455	55
TT	414 - 420	415.25	419.75	461	56
UU	420 - 426	421.25	425.75	467	57
VV	426 - 432	427.25	431.75	473	58
WW	432 - 438	433.25	437.75	479	59
XX	438 - 444	439.25	443.75	485	60
YY	444 - 450	445.25	449.75	491	61
ZZ	450 - 456	451.25	455.75	497	62
AAA	456 - 462	457.25	461.75	503	63
BBB	462 - 468	463.25	467.75	509	64

CATV ULTRA-BAND FREQUENCY CHART

CHANNEL NUMBER	FREQUENCY LIMITS (MHz)	VIDEO CARRIER FREQUENCY (MHz)	AUDIO CARRIER FREQUENCY (MHz)	OSC. FREQ. (MHz)
65	468 - 474	469.25	473.75	515
66	474 - 480	475.25	479.75	521
67	480 - 486	481.25	485.75	527
68	486 - 492	487.25	491.75	533
69	492 - 498	493.25	497.75	539
70	498 - 504	499.25	503.75	545
71	504 - 510	505.25	509.75	551
72	510 - 516	511.25	515.75	557
73	516 - 522	517.25	521.75	563
74	522 - 528	523.25	527.75	569
75	528 - 534	529.25	533.75	575
76	534 - 540	535.25	539.75	581
77	540 - 546	541.25	545.75	587
78	546 - 552	547.25	551.75	593
79	552 - 558	553.25	557.75	599
80	558 - 564	559.25	563.75	605
81	564 - 570	565.25	569.75	611
82	570 - 576	571.25	575.75	617
83	576 - 582	577.25	581.75	623
84	582 - 588	583.25	587.75	629
85	588 - 594	589.25	593.75	635
86	594 - 600	595.25	599.75	641
87	600 - 606	601.25	605.75	647
88	606 - 612	607.25	611.75	653
89	612 - 618	613.25	617.75	659
90	618 - 624	619.25	623.75	665
91	624 - 630	625.25	629.75	671
92	630 - 636	631.25	635.75	677
93	636 - 642	637.25	641.75	683
94	642 - 648	643.25	647.75	689
95	648 - 654	649.25	653.75	695
96	654 - 660	655.25	659.75	701
97	660 - 666	661.25	665.75	707
98	666 - 672	667.25	671.75	713
99	672 - 678	673.25	677.75	719
100	678 - 684	679.25	683.75	725
101	684 - 690	685.25	689.75	731
102	690 - 696	691.25	695.75	737
103	696 - 702	697.25	701.75	743
104	702 - 708	703.25	707.75	749
105	708 - 714	709.25	713.75	755
106	714 - 720	715.25	719.75	761
107	720 - 726	721.25	725.75	767
108	726 - 732	727.25	731.75	773
109	732 - 738	733.25	737.75	779
110	738 - 744	739.25	743.75	785
111	744 - 750	745.25	749.75	791

CATV Ultra-Band Frequency Chart (Cont'd.)

CHANNEL NUMBER	FREQUENCY LIMITS (MHz)	AUDIO CARRIER FREQUENCY (MHz)	SOUND CARRIER FREQUENCY (MHz)	OSC. FREQ. (MHz)
112	750 - 756	751.25	755.75	797
113	756 - 762	757.25	761.75	803
114	762 - 768	763.25	767.75	809
115	768 - 774	769.25	773.75	815
116	774 - 780	775.25	779.75	821
117	780 - 786	781.25	785.75	827
118	786 - 792	787.25	791.75	833
119	792 - 798	793.25	797.75	839
120	798 - 804	799.25	803.75	845

HRC* CATV LOW-, MID-, AND HIGH-BAND FREQUENCY CHART

HRC CHANNEL NUMBER	FREQUENCY LIMITS (MHz)	VIDEO CARRIER FREQUENCY (MHz)	AUDIO CARRIER FREQUENCY (MHz)	OSC. FREQ. (MHz)	CHANNEL INDICATOR
		HRC Low-Band			
2	52.75-58.75	54.00	58.50	99.75	2
3	58.75-64.75	60.00	64.50	105.75	3
4	64.75-70.75	66.00	70.50	111.75	4
A-8(4+)	70.75-76.75	72.00	76.50	117.75	00
5	76.75-82.75	78.00	82.50	123.75	5
6	82.75-88.75	84.00	88.50	129.75	6
		HRC Mid-Band			
A-2	106.75-112.75	108.00	112.50	153.75	0
A-1	112.75-118.75	114.00	118.50	159.75	1
A	118.75-124.75	120.00	124.50	165.75	14
B	124.75-130.75	126.00	130.50	171.75	15
C	130.75-136.75	132.00	136.50	177.75	16
D	136.75-142.75	138.00	142.50	183.75	17
E	142.75-148.75	144.00	148.50	189.75	18
F	148.75-154.75	150.00	154.50	195.75	19
G	154.75-160.75	156.00	160.50	201.75	20
H	160.75-166.75	162.00	166.50	207.75	21
I	166.75-172.75	168.00	172.50	213.75	22
		HRC High-Band			
7	172.75-178.75	174.00	178.50	219.75	7
8	178.75-184.75	180.00	184.50	225.75	8
9	184.75-190.75	186.00	190.50	231.75	9
10	190.75-196.75	192.00	196.50	237.75	10
11	196.75-202.75	198.00	202.50	243.75	11
12	202.75-208.75	204.00	208.50	249.75	12
13	208.75-214.50	210.00	214.50	255.75	13

*Harmonically-related carriers

HRC CATV, SUPER- AND HYPER-BAND FREQUENCY CHART

CHANNEL NUMBER	FREQUENCY LIMITS (MHz)	VIDEO CARRIER FREQUENCY (MHz)	AUDIO CARRIER FREQUENCY (MHz)	OSC. FREQ. (MHz)	CHANNEL INDICATOR
		HRC Super-Band			
J	214.75-220.75	216.00	220.50	261.75	23
K	220.75-226.75	222.00	226.50	267.75	24
L	226.75-232.75	228.00	232.50	273.75	25
M	232.75-238.75	234.00	238.50	279.75	26
N	238.75-244.75	240.00	244.50	285.75	27
O	244.75-250.75	246.00	250.50	291.75	28
P	250.75-256.75	252.00	256.50	297.75	29
Q	256.75-262.75	258.00	262.50	303.75	30
R	262.75-268.75	264.00	268.50	309.75	31
S	268.75-274.75	270.00	274.50	315.75	32
T	274.75-280.75	276.00	280.50	321.75	33
U	280.75-286.75	282.00	286.50	327.75	34
V	286.75-292.75	288.00	292.50	333.75	35
W	292.75-298.75	294.00	298.50	339.75	36
		HRC Hyper-Band			
AA	298.75-304.75	300.00	304.50	345.75	37
BB	304.75-310.75	306.00	310.50	351.75	38
CC	310.75-316.75	312.00	316.50	357.75	39
DD	316.75-322.75	318.00	322.50	363.75	40
EE	322.75-328.75	324.00	328.50	369.75	41
FF	328.75-334.75	330.00	334.50	375.75	42
GG	334.75-340.75	336.00	340.50	381.75	43
HH	340.75-346.75	342.00	346.50	387.75	44
II	346.75-352.75	348.00	352.50	393.75	45
JJ	352.75-358.75	354.00	358.50	399.75	46
KK	358.75-364.75	360.00	364.50	405.75	47
LL	364.75-370.75	366.00	370.50	411.75	48
MM	370.75-376.75	372.00	376.50	417.75	49
NN	376.75-382.75	378.00	382.50	423.75	50
OO	382.75-388.75	384.00	388.50	429.75	51
PP	388.75-394.75	390.00	394.50	435.75	52
QQ	394.75-400.75	396.00	400.50	441.75	53
RR	400.75-406.75	402.00	406.50	447.75	54
SS	406.75-412.75	408.00	412.50	453.75	55
TT	412.75-418.75	414.00	418.50	459.75	56
UU	418.75-424.75	420.00	424.50	465.75	57
VV	424.75-430.75	426.00	430.50	471.75	58
WW	430.75-436.75	432.00	436.50	477.75	59
XX	436.75-442.75	438.00	442.50	483.75	60
YY	442.75-448.75	446.00	448.50	489.75	61
ZZ	448.75-454.75	452.00	454.50	495.75	62
AAA	454.75-460.75	458.00	460.50	501.75	63
BBB	460.75-466.75	462.00	466.50	507.75	64

ICC* CATV LOW-, MID-, AND HIGH-BAND FREQUENCY CHART

ICC CHANNEL NUMBER	FREQUENCY LIMITS (MHz)	VIDEO CARRIER FREQUENCY (MHz)	AUDIO CARRIER FREQUENCY (MHz)	OSC. FREQ. (MHz)	CHANNEL INDICATOR
		ICC Low-Band			
2	54 - 60	55.25	59.75	101	2
3	60 - 66	61.25	65.75	107	3
4	66 - 72	67.25	71.75	113	4
A-8(4+)	72 - 78	73.25	77.75	119	00
5	78 - 84	79.25	83.75	125	5
6	84 - 90	85.25	89.75	131	6
		ICC Mid-Band			
A-2	108 - 114	109.25	113.75	155	0
A-1	114 - 120	115.25	119.75	161	1
A	120 - 126	121.25	125.75	167	14
B	126 - 132	127.25	131.75	173	15
C	132 - 138	133.25	137.75	179	16
D	138 - 144	139.25	143.75	185	17
E	144 - 150	145.25	149.75	191	18
F	150 - 156	151.25	155.75	197	19
G	156 - 162	157.25	161.75	203	20
H	162 - 168	163.25	167.75	209	21
I	168 - 174	169.25	173.75	215	22
		ICC High-Band			
7	174 - 180	175.25	179.75	221	7
8	180 - 186	181.25	185.75	227	8
9	186 - 192	187.25	191.75	233	9
10	192 - 198	193.25	197.75	239	10
11	198 - 204	199.25	203.75	245	11
12	204 - 210	205.25	209.75	251	12
13	210 - 216	211.25	215.75	257	13

*Incremental Coherent Carriers

ICC CATV SUPER- AND HYPER-BAND FREQUENCY CHART

ICC CHANNEL NUMBER	FREQUENCY LIMITS (MHz)	VIDEO CARRIER FREQUENCY (MHz)	AUDIO CARRIER FREQUENCY (MHz)	OSC. FREQ. (MHz)	CHANNEL INDICATOR
		ICC Super-Band			
J	216 - 222	217.25	221.75	263	23
K	222 - 228	223.25	227.75	269	24
L	228 - 234	229.25	233.75	275	25
M	234 - 240	235.25	239.75	281	26
N	240 - 246	241.25	245.75	287	27
O	246 - 252	247.25	251.75	293	28
P	252 - 258	253.25	257.75	299	29
Q	258 - 264	259.25	263.75	305	30
R	264 - 270	265.25	269.75	311	31
S	270 - 276	271.25	275.75	317	32
T	276 - 282	277.25	281.75	323	33
U	282 - 288	283.25	287.75	329	34
V	288 - 294	289.25	293.75	335	35
W	294 - 300	295.25	298.83	341	36
		ICC Hyper-Band			
AA	300 - 306	301.25	305.75	347	37
BB	306 - 312	307.25	311.75	353	38
CC	312 - 318	313.25	317.75	359	39
DD	318 - 324	319.25	323.75	365	40
EE	324 - 330	325.25	329.75	371	41
FF	330 - 336	331.25	335.75	377	42
GG	336 - 342	337.25	341.75	383	43
HH	342 - 348	343.25	347.75	389	44
II	348 - 354	349.25	353.75	395	45
JJ	354 - 360	355.25	359.75	401	46
KK	360 - 366	361.25	365.75	407	47
LL	366 - 372	367.25	371.75	413	48
MM	372 - 378	373.25	377.75	419	49
NN	378 - 384	379.25	383.75	425	50
OO	384 - 390	385.25	389.75	431	51
PP	390 - 396	391.25	395.75	437	52
QQ	396 - 402	397.25	401.75	443	53
RR	402 - 408	403.25	407.75	449	54
SS	408 - 414	409.25	413.75	455	55
TT	414 - 420	415.25	419.75	461	56
UU	420 - 426	421.25	425.75	467	57
VV	426 - 432	427.25	431.75	473	58
WW	432 - 438	433.25	437.75	479	59
XX	438 - 444	439.25	443.75	485	60
YY	444 - 450	445.25	449.75	491	61
ZZ	450 - 456	451.25	455.75	497	62
AAA	456 - 462	457.25	461.75	503	63
BBB	462 - 468	463.25	467.75	509	64

IN CASE OF DIFFICULTY

X-RADIATION PRECAUTION FOR PERSONNEL DURING SERVICING

The only potential source of X-radiation in this television receiver is the picture tube, which is constructed of materials which reduce X-ray radiation. This tube will not emit X-rays when the high voltage is at the factory-specified level. Refer to the Precaution Label located inside the television receiver for the correct high voltage, which is 18 kV at zero beam current.

If you should have to replace the CRT anode connector, return the entire main module to the factory for service.

This part of the Manual will help you locate and correct difficulties which might occur in your Portable Color Television Set. Begin your search for any trouble that occurs after assembly by carefully following the steps listed below under "Crosshatch Generator Visual Checks" on the following page.

After you complete the "Visual Checks," refer to the "Troubleshooting Charts." Start at the first chart and locate the first condition that best describes the problem you observe. Then perform the tests listed under that condition to determine which module is most likely at fault. When you locate a module that you suspect is faulty, we recommend that you return it to either the factory or one of the Heath Electronic Centers for exchange.

Refer to "Circuit Board Module Service Policy" on Page 77 for more information.

In an extreme case where you are unable to resolve a difficulty, refer to the "Service Facilities" information that begins on Page 75. Your Warranty is located inside the front cover of this Manual.

If it ever becomes necessary to take (or ship) your kit to the Heath Company or to a Heath/Zenith Computers and Electronics Center for repair, be sure it is completely assembled. Also make sure that you include all of the knobs and cabinet parts.

Be sure you read the "Precautions for Bench Testing" on Page 64 before you use a voltmeter or do any power-on testing on this Television Set.

CROSSHATCH GENERATOR VISUAL CHECKS

1. About 90% of the kits that are returned for repair do not function properly due to improper connections and soldering. Therefore, you can eliminate many difficulties by carefully inspecting each of your connections to make sure it is connected as described in the assembly part of the Manual. It is frequently helpful to have a friend check your work who is not familiar with the unit and who may notice something that you have consistently overlooked.

2. Be sure there are no solder bridges between adjacent connections. Check the "Crosshatch Generator Circuit Board X-Ray View" for any questions you may have concerning the foil pattern.

3. Check capacitor values carefully. Be sure the proper value part is installed at each capacitor location and that the positive (+) or negative (-) marks are oriented correctly.

4. Be sure the correct diode is installed at each diode location, and that the banded end is positioned correctly.

5. Check to be sure all transistors are in their proper locations and the leads are properly oriented.

6. Check all component leads connected to the circuit board. Make sure that none of the leads make contact with other connections or components.

7. Check the plug interconnections between the main module and the crosshatch generator circuit board.

PRECAUTIONS FOR BENCH TESTING

1. Be cautious when you test solid-state circuits. Although semiconductor devices have almost unlimited life when used properly, they are much more vulnerable to damage from excessive voltage or current than other circuit components.

2. Be sure you do not short any terminals to ground when you make voltage measurements. If the probe should slip, for example, and short out a voltage source, you could damage one or more components.

3. Do not remove components while the TV Set is plugged in.

WARNING: High voltage is present at several points and is potentially lethal. Be careful to avoid personal shock when you work on this TV Set with the power applied.

TROUBLESHOOTING CHARTS

The following charts list the "Condition," "Tests," and "Possible Cause" of some possible malfunctions. Under some of the conditions you will find several tests you can make. These tests should help you narrow down the problem to a specific area or, in some cases, a specific part. If a particular part or parts are mentioned (transistor Q904, for example, or connector 5A3, pin 2) as a possible cause, check these parts to see if they are properly installed. It is also possible, on rare occasions, for a part to be faulty.

NOTES:

1. When you are directed to make an ohmmeter measurement, be sure to unplug the line cord of the TV Set. Also, we recommend that you unplug the line cord whenever you connect or disconnect the voltmeter.

2. Since several circuit modules are involved in some of the troubleshooting tests, the Pictorial numbers will not be called out each

time. The modules will be referred to by name and will correspond to the following Pictorials:

Overall TV Set	Pictorial 7-1
Keyboard assembly	Pictorial 7-2
VHF/UHF Tuner	Pictorial 7-3
Video Output module	Pictorial 7-4
Main module	Pictorial 7-5
DC-AC Converter module	Pictorial 7-6
Crosshatch Generator board	Pictorial 7-7

3. When you disconnect a cable connector from a module plug, rock the connector from end-to-end while you pull up on it. DO NOT rock the connector from front-to-back; otherwise, you could bend the contacts inside the connector and cause them to make intermittent contact with the plug pins.

To use the following charts, first find the condition that best describes your TV Set's symptoms. Then perform each test in the "Test" column for that symptom. When you find a test that does not produce the indicated results, refer to the items listed under "Possible Cause."

NOTE: This TV Set has two separate ground systems:

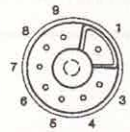
- An AC line-isolated common connection is available at the VHF/UHF tuner ground tab. Use only this point for instrument ground connections when you make measurements in circuits which use the ⏚ ground symbol on the schematic. Use this ground unless otherwise noted.

- When you make tests on the DC/AC converter module or the horizontal output circuit, use a line isolation transformer capable of 0.8 amperes or 75 watts, and connect your meter's negative lead to the large heat sink on the main module (indicated by the ⏚ ground symbol on the schematic).

For continued protection, use only exact replacement component parts when you replace the fuse or any part identified with an "X" (safety) designator in the Replacement Parts List or on the Schematic.

CONDITION		
TV does not come on when you press the front panel off/on button during AC line operation of the TV Set.		
	1. Unplug the line cord from the AC outlet. Unplug connector 3Z7 and measure the resistance between pins 1 and 2 on the connector. When the off/on pushbutton is depressed you should measure 0Ω. Reconnect connector 3Z7.	A. Defective off/on switch. B. Open connection at 3Z7.
	2. Measure the resistance between the narrow blade of the line cord plug and terminal 2 of connector 8S3 for 0 Ω.	A. Fuse FX3299. B. Line cord. C. Open connection at pin 1 of connector 3R8. D. Open connection at pin 2 of connector 3S8. E. Cable assembly 3S8/8S3. F. Main module.
	3. Measure the resistance between the wide line cord blade and terminal 1 of connector 8S3 for 0 Ω.	A. Line cord. B. Open connection at pin 3 of connector 3R8. C. Open connection at pin 3 of connector 3S8. D. Cable assembly 3S8/8S3. E. Main module.
	4. Plug in the line cord and turn the TV Set on. Measure the voltage at pin 3 of ICX3202 for 160 VDC. Connect the voltmeter common lead to the DC/AC converter heat sink.	A. Problem on the main module.
TV does not come on when you press the front panel off/on button during DC operation.		
	1. Measure the resistance between the center pin of the cigarette lighter plug of the DC power cord and pin 3 of the cord plug for 0 Ω.	A. Fuse inside cigarette lighter plug is open. B. DC power cord.
	2. Unplug the line cord from the DC supply. Unplug connector 3W3 and measure the resistance between pins 1 and 2 on the connector. When the off/on pushbutton is depressed, you should measure 0 Ω.	A. Deffective off/on switch. B. Open connection at connector 3W3.
	3. Measure the resistance between connector 3W3 pin 1 on the DC/AC converter module and pin 3 on the power input socket for 0 Ω.	A. Fuse FX1. B. Power input socket. C. Cable assembly.

CONDITION	TESTS	POSSIBLE CAUSE
	4. Measure the resistance between connector 3W3 pin 2 on the DC/AC converter module and pin 5 of the DC/AC power input socket for 380 Ω. Reinstall connector 3W3.	A. DC/AC converter module.
	5. Connect the DC power cord to a 12 VDC source. Depress the Off/On button to the on position. Measure the voltage at pin 1 of connector 3E3 for 175 VDC. Use the DC/AC converter module heat sink for the common connection of your voltmeter.	A. DC/AC converter module.
Sound is okay. Picture is black but high voltage is present (listen for a crackling sound from the picture tube when you turn the Set on).		
	1. Look for a filament glow inside the neck of the picture tube. If you see a glow, proceed directly to test 5.	
	2. Unplug connector 3A5 from the main module. Then measure the resistance between connector 3A5 pin 4 on the main module and ground for 4 Ω.	A. Problem on the main module.
	3. Measure the resistance between pins 4 and 2 on connector 5A3 on the video output module for 7 Ω.	A. The picture tube socket on the video output module is not making good contact with the picture tube. B. Problem on the video output module. C. Open picture tube heater.
	4. Reconnect connector 3A5 to the main module and measure the resistance between pins 2 and 4 on connector 5A3 for 2.5 Ω.	A. Cable assembly 3A5/5A3.
	5. Measure the voltage at connector 5A3 pin 1 on the video output module for 12 VDC.	A. Connector 5A3 is not making good contact with the circuit board. B. Cable assembly 5A3/3A5. C. Main module.
	6. Measure the voltage at connector 3A5 pin 1 on the main module for 12 VDC.	A. Problem on the main module.
	7. Measure the voltage at connector 5A3 pin 3 on the video output module for 175 VDC.	A. Problem on the main module. B. Cable assembly 5A3/3A5.
	8. Measure the voltage at the CRT socket pins 3, 7, and 9 for 140 to 150 VDC.	A. Problem on the video output module.
	9. Measure the voltage at connector 5C2 pins 1, 2, and 3, on the video output module for 2-3 VDC.	A. Cable assembly 2C5/5C2. B. Problem on the main module.



ENLARGED VIEW OF BASE
(REAR VIEW)

BASE WIRING

PIN 1 FOCUS
PIN 3 BLUE CATHODE
PIN 4 HEATER
PIN 5 HEATER
PIN 6 GRID NO. 1
PIN 7 RED CATHODE
PIN 8 GRID NO. 2
PIN 9 GREEN CATHODE

PINS 2 AND 10
ARE OMITTED.

CONDITION	TESTS	POSSIBLE CAUSE
	10. Measure the voltage at connector 5X3 pin 1 for 350-400 VDC.	A. Problem on the main module. B. Cable assembly 3X5/5X3.
	11. If all of the tests were okay, the problem is most likely on the video output module or the picture tube.	
Bright screen with little or no picture. Picture and Black Level controls have no effect.		
	1. Measure the voltage at connector 5A3 pin 3 on the video output module for 175 VDC.	A. Connector 5A3 is not making good contact with the circuit board. B. Problem on main module. C. Cable assembly 5A3/3A5.
	2. Measure the voltage at connector 5X3 pin 1 on the video output module for 355 VDC.	A. Connector 5X3 is not making good contact with the circuit board. B. Problem on the main module. C. Cable assembly 5X3/3X5.
	3. Measure the voltage at the CRT socket pins 3, 7, and 9 for between 140 and 150 VDC.	A. Problem on the video output module.
	4. Measure the voltage at connector 5C2 pins 1, 2, and 3, on the video output module for 2-3 VDC.	A. Cable assembly 2C5/5C2. B. Problem on the main module.
No vertical deflection. A line is visible across the center of the picture tube screen. **CAUTION:** Do **not** operate your TV Set for more than a few seconds if this condition exists. Otherwise, the picture tube may be permanently damaged.		
	1. Measure the voltage at connector 2A3 pins 1 and 2 on the main module for 9 VDC.	A. Problem on the main module.
	2. Unplug connector 2A3 from the main module. Then measure the resistance between pins 1 and 2 on 2A3 on the module for 270 Ω.	A. Open connection at connector 2A3 pin 1 or 2. B. Open winding in the deflection yoke (on the neck of the CRT).
	3. Measure the resistance between pins 1 and 2 on connector 2A3 for 11Ω. Reinstall connector 2A3.	A. Connector 2A3 is not making good contact with the main module.
	4. Measure the voltage at pin 2 of IC2376 on the main module for 18 VDC.	A. Problem on the main module.
Dimly lit screen. Brightness varies with the picture and Black Level controls. Sound is normal.		
	1. Measure the voltage at pin 29 of IC2376 on the main module for 0 to 8 VDC.	A. Problem on the main module.

CONDITION	TESTS	POSSIBLE CAUSE
	2. Measure the voltage at connector 1M pin 3 on the main module for 6 VDC.	A. Open cable or connection on the IF input connector J1201 on the main module and the VHF/UHF tuner. B. Problem on the main module.
Brightly lit screen with bright diagonal lines. Picture and Black Level controls have no effect.		
	1. Unplug the Set-Up shorting plug, rotate it 90°, and plug it back in the Set-Up position. Adjust the G2 control for a black screen, then return the shorting plug to the normal position.	A. Problem on the main module. B. Problem on the video output module.
	2. Measure the voltage at pin 6 of the CRT socket for 25 VDC.	A. Problem on the video output module. B. Picture tube.
	3. Measure the voltage at connector 5A3 pin 3 on the video output module for 175 VDC.	A. Cable assembly 3A5/5A3. B. Problem on the main module.
Black screen. Highlight color may appear when you turn the Color Level control up (clockwise).		
	1. Measure the voltage at pin 30 of IC2376 on the main module for between 2 and 5 VDC (varies with the Black Level control setting).	A. Problem on the main module.
No color during color broadcasts. Black and white picture and sound are normal.		
	1. Measure the voltage at pin 12 of IC2376 on the main module for 7 VDC.	A. Problem on the main module.
	2. Measure the voltage at pin 10 of IC2376 for 3.8 VDC.	A. Problem on the main module.
Snow on screen and no picture. Hissing in the sound.		
	1. Unplug connector 6K5 from the VHF/UHF tuner. Then measure the voltage at connector 6K5 pin 11 for 12 VDC.	A. Open connection between connector 3K6, pin 2, on the main module and connector 6K5, pin 11 on the VHF/UHF tuner. B. Problem on the main module.
	2. Reconnect connector 6K5 to the VHF/UHF tuner. Then measure the voltage at connector 3K6 pin 3 on the main module for -20 VDC.	A. Problem on the main module.

CONDITION	TESTS	POSSIBLE CAUSE
	3. Measure the voltage at connector 6K5 pin 10 on the VHF/UHF tuner for -20 VDC.	A. Open connection between connector 3K6 on the main module and connector 6K5 on the VHF/UHF tuner. B. Problem on the VHF/UHF tuner.
Black screen. No picture, but there is a hissing sound.		
	1. Measure the voltage at connector 3A8 pin 1 on the main module. You should measure 12 VDC.	A. Problem on the main module.
	2. Measure the voltage at connector 6K5 pin 11 on the VHF/UHF tuner for 12 VDC.	A. Open connection between connector 3K6 on the main module and connector 6K5 on the VHF/UHF tuner. B. Problem on the VHF/UHF tuner.
No vertical sync (picture rolls vertically).		
	1. Measure the voltage at pin 8 of IC2376 for .56 VDC.	A. Problem on the main module.
No horizontal sync (picture is not locked horizontally).		
	1. Measure the voltage at pin 32 of IC2376 on the main module for .1 VAC and 1 VDC.	A. Problem on the main module.
Picture normal, no sound.		
	1. Measure the voltage at connector 3C4 pin 2 on the main module for 18 VDC.	A. Problem on the main module.
	2. Unplug connector 4K4 from the main module and measure the voltage at plug 4K4 pin 1 for 5 VDC. Reinstall connector 4K4.	A. Problem on the main module.
	3. Measure the voltage at connector 4K4 pin 1 on the main module for between 3.5 and 0 VDC (depends on the Volume control setting).	A. Open connection between connector 6G4 pin 1 on the VHF/UHF tuner and connector 4K4 on the main module. B. Problem on the VHF/UHF tuner.
	4. If the above tests were okay, check for open leads between connector 4P4 on the main module and the speaker.	

CONDITION	TESTS	POSSIBLE CAUSE
No channel display.		
	1. Measure the voltage at plug 6K5 pin 8 on the VHF/UHF tuner for 5 VDC.	A. Problem on the main module.
	2. Measure the voltage at connector 6A7 pins 2 and 3 on the VHF/UHF tuner for 5 VDC.	A. Problem on the VHF/UHF tuner.

Keyboard Assembly Connections

The keyboard assembly uses a 3 by 7 matrix arrangement as shown in Table 7-8. For example, when you press the 7-key, connector 6A7 pin H makes contact with connector 6B7 pin D.

	CONNECTOR						
CONNECTOR	6A7 PIN D	6A7 PIN E	6A7 PIN F	6A7 PIN G	6A7 PIN H	6B7 PIN A	6B7 PIN B
6B7, PIN E	POWER (not used)	—	SKIP	VOL DOWN	VOL UP	CHAN DOWN	CHAN UP
6B7, PIN D	—	ENTER	9	8	7	6	5
6B7, PIN C	BAND	4	3	2	1	0	AFC

Table 7-8

CONDITION	TESTS	POSSIBLE CAUSE
Single key does not operate.		
	1. Unplug connectors 6A7 and 6B7 from the VHF/UHF tuner. Measure the resistance between the connector pins that correspond to the inoperative key (see Table 7-3 for the key connection continuity designations). The resistance should be 0 Ω when you depress the key. If the key checks okay with the ohmmeter, the problem is on the VHF/UHF tuner.	A. Defective keyboard assembly.
Off/On button does not operate.		
	1. Unplug connectors 3W3 and 3Z7 from the DC/AC converter module. Then measure the resistance between connector 3W3 pins 1 and 2, and 3Z7 pins 1 and 2. You should measure 0 Ω with the key depressed.	A. Defective switch.

Crosshatch Generator Problems

The following information concerns problems that are related to the crosshatch generator circuit board.

CONDITION	POSSIBLE CAUSE
Very bright white screen when you switch SW901 to Crosshatch.	A. Open red wire (+18 VDC) between resistor R2714 on the main module and hole F on the crosshatch generator circuit board. B. Resistor R921. C. Diode D905. D. Capacitor C904. E. Transistor Q905.
White screen level varies when you adjust the Crosshatch Level control (R911).	A. Integrated circuit U901, U902, or U903.
Vertical lines are okay; no horizontal lines.	A. Open green wire (30 V peak-to-peak) between resistor RX2704 on the main module and hole E on the crosshatch generator circuit board. B. Transistor Q904. C. Integrated circuit U901 or U902. D. Diode D901.

CONDITION	POSSIBLE CAUSE
Horizontal lines are okay; vertical lines are slanted.	A. Transistor Q903. B. Integrated circuit U903.
Diagonal dot pattern on the screen.	A. Open white wire between pin 5 of IC 2100 on the main module and hole C on the crosshatch generator circuit board. B. Integrated circuit U901 or U902. C. Transistor Q904.
Dots appear in crosshatch pattern.	A. Transistor Q902. B. Integrated circuit U903.
Horizontal lines are okay; no vertical lines.	A. Transistor Q901, Q902, or Q903. B. Integrated circuit U901 or U902. C. Diode D902.
Black screen.	A. Transistors Q901, Q902, or Q903. B. Integrated circuit U901. C. Open yellow wire between inductor L2288 on the main module and hole A on the crosshatch generator circuit board.

SERVICE FACILITIES

Heath Company, a subsidiary of Zenith Electronics Corporation, provides you with several services, including our Technical Consultation, Parts, and Service Departments, each of which is outlined below. In addition to these services, we have included for your convenience a separate (Zenith) "Replacement Parts List" so you can obtain separate components for your Television Set if you desire.

During the Warranty period of your Television Set, you can exchange modules (preassembled and factory aligned circuit boards) through the Heath Factory, or your nearest Heath/Zenith Computers & Electronics Center. **Warranty Service Is Available Only Through The Heath Factory Or A Heath/Zenith Computers & Electronics Center.**

AFTER WARRANTY, you may exchange modules at reasonable rates through the Heath Factory or a Heath/Zenith Computers & Electronics Center. You may also elect to obtain preassembled module replacement components through a local authorized **Zenith Service Center. These individual parts are not available from the Heath Company or the Heath/Zenith Computers & Electronics Centers.**

REPLACEMENT PARTS

Please provide complete information when you request Heath replacement parts from either the factory or Heath/Zenith Computers & Electronics Centers. Be certain to include the HEATH part number exactly as it appears in the Parts List.

Ordering From the Factory

Print all the information requested on the parts order form furnished with this product and mail it to Heath Company. For telephone orders (Heath parts only) dial 616 982-3571. If you are unable to locate an order form, write us a letter or card including:

- Heath part number.
- Model number.
- Date of purchase.
- Location where purchased or invoice number.
- Nature of the defect.
- Your payment or authorization for COD shipment of parts not covered by the warranty.

Mail letters to: Heath Company
Benton Harbor, MI 49022
Attn: Parts Replacement Dept.

Retain the original parts until you receive replacements. Parts that should be returned to the factory will be listed on your packing slip.

Obtaining Replacement Parts From A Heath/Zenith Computers & Electronics Center

For your convenience, "over the counter" Heath replacement parts are available from the Heath/Zenith Computers & Electronics Centers listed in your catalog. Be sure to bring in the original part and purchase invoice when you request a warranty replacement from a Heath/Zenith Computers & Electronics Center.

TECHNICAL CONSULTATION

Need help with your kit? - Self-Service? - Construction? - Operation? - Call **616-982-3307** or write for assistance. You'll find our Technical Consultants eager to help with just about any technical problem except "customizing" for unique applications.

The effectiveness of our consultation service depends on the information you furnish. Be sure to tell us:

- The Model number (from the blue and white label).
- The date of purchase.
- An exact description of the difficulty.
- Everything you have done in attempting to correct the problem.
- The complete Manual number.

Also include switch positions, connections to other units, operating procedures, voltage readings, and any other information you think might be helpful.

Please do not send parts for testing, unless this is specifically requested by our Consultants.

HINTS: Telephone traffic is lightest at midweek. Please be sure your Manual and notes are on hand when you call us.

Heath/Zenith Computers & Electronics Center facilities are also available for telephone or "walk-in" personal assistance.

REPAIR SERVICE

Service facilities are available, if they are needed, to repair your completed kit. (Kits that have been modified, or soldered with paste flux or acid core solder, cannot be accepted for repair.)

If it is convenient, personally deliver your kit to a Heath/Zenith Computers & Electronics Center. For warranty service, supply a copy of the invoice or sales slip.

If you prefer to ship your kit to the factory, attach a letter, containing the following information, directly to the unit:

- Your name and address.
- Date of purchase and invoice number.
- Copies of all correspondence relevant to the service of the kit.
- A brief description of the difficulty.
- Authorization to return your kit COD for the service and shipping charges. (This will reduce the possibility of delay.)

Check the equipment to see that all screws and parts are secured. Do not include the kit Manual. Place the equipment in a strong carton with at least THREE INCHES of resilient packing material (shredded paper, excelsior, etc.) on all sides. Use additional packing material where there are protrusions, such as knobs. If the unit weighs over 15 lbs., place this carton in another carton with at least 3/4" of packing material between the two.

Seal the carton with reinforced gummed tape, tie it with a strong cord, and mark it "Fragile" on at least two sides. Remember, the carrier will not accept liability for shipping damage if the unit is insufficiently packed. Ship by prepaid express, United Parcel Service, or insured Parcel Post to:

Heath Company
Service Department
Benton Harbor, Michigan 49022

CIRCUIT BOARD MODULE SERVICE POLICY

This color TV receiver was designed to give maximum performance with utmost service simplicity. To help you service your TV Set, it is sectionalized into circuit boards, or "modules." You can remove any one of these modules for inspection or service.

This Manual contains troubleshooting procedures to help you isolate troubles to specific modules. Also, our trained technical staff will assist you by letter or telephone in troubleshooting your TV Set to the "module level."

SPECIAL SERVICE FACILITY

Special service facilities have been established at our Heath/Zenith Computers & Electronics Centers and factory to exchange TV circuit board modules.* After you have isolated the problem to a particular module(s), you may return the module(s) for exchange under this policy. **Do not mail** the module to a Heath/Zenith Computers & Electronics Center. You may, however, either take the module(s) to the Center or mail it directly to the factory.

MODULE SERVICE

In Warranty — If a module proves defective during the 90-day warranty period, the factory-assembled modules will be exchanged with no charge for parts or labor. If the problem is due to a construction error that you have made (improper cable connections, etc.), there will be a service charge. Customer-assembled circuit boards will be serviced rather than exchanged.

Out of Warranty — After the standard 90-day warranty expires, any of the modules that require service and are returned to a Heath service facility will be exchanged or serviced at an established rate.

HOW TO RETURN MODULES

Pack the module(s) carefully in a suitable carton. ** Be sure to use plenty of packing material to protect the module(s). Include the following information in the pack:

1. A letter describing the symptoms observed in your TV Set.
2. The Model number (refer to the blue and white label).
3. The location, date of purchase, and invoice number.
4. Your complete return address.

Ship the carton by insured parcel post, or UPS, to "Heath Company, Benton Harbor, Michigan 49022, Attn: Service Department."

The above service policy applies only to modules. If a problem appears to be somewhere other than on one of the modules, please check with your nearest Heath/Zenith Computers & Electronics Center or our Technical Consultants before you return the Set for service.

*Factory-assembled modules only.

** NOTE: If it should ever become necessary to return the main module for service, first repack it in its original carton and packing material before you place it in this "suitable carton."

COLOR APC

1. Select a strong station signal from the antenna.
2. Set the TINT control to the center of its rotation.
3. Set the COLOR control fully clockwise.
4. Unplug setup jumper 2J from its NORMAL position, rotate it 45° CW, and plug it over its SET-UP position pins.
5. Adjust the APC Adjust control (R2390) slowly until the color bars become wider and fewer in number. Adjust the control until the entire picture is predominantly one color. NOTE: The color may drift slowly from red to green to blue.
6. Return jumper 2J to its NORMAL position.
7. Readjust the TINT and COLOR controls to your preference.
8. Turn the TV Set off.

VOLUME PRESET

NOTE: Whenever you connect the TV Set's power cord to a power source and then turn the TV Set on after the cord has been disconnected, the sound level from the speaker will depend on the setting of the Volume Preset control. Therefore, perform one of the following numbered steps only if you wish to change this initial sound level.

1. If the initial sound level from your speaker is too low, turn Volume Preset control R1451 a small amount CW until you obtain the desired listening level.
2. If the initial sound level from your speaker is too high, turn Volume Preset control R1451 a small amount CCW until you obtain the desired listening level.

This completes the "Instrument Alignment."

INSTRUMENT ALIGNMENT

Instrument realignment of this TV Set is not normally required. The following information is provided in case realignment is needed at some future time due to parts replacement.

WARNING: Do not attempt to align this TV Set unless you have had previous TV alignment experience, a thorough knowledge of the theory involved, and the necessary equipment.

NOTE: Clockwise (CW) or counterclockwise (CCW) means the direction of rotation as viewed from the knob side of the control.

Refer to Pictorial 8-1 for the locations of the test points and adjustments on the main module.

AUDIO CIRCUIT

1. Align detector coil L1426 on the main module for minimum sound distortion, using a strong station from the antenna.

IF CIRCUIT

1. Push the cabinet front AFC button until an "F" appears in the LED display window. Using a weak signal (about 500 µV), adjust bandpass coil L1204 for maximum AGC voltage on the IF AGC test stake; then turn the coil core CW 1/2 turn.
2. Adjust the oscillator coil (L1230) for 4.2 volts DC at the APC test point.
3. Adjust the DC phase control (L1213) for the best transients during large white-to-black excursions.
4. Adjust the limiter coil (L1209) for minimum buzz in the audio. After you make this adjustment, recheck the phase adjustment in step 3.
5. Select a low VHF channel (2-6). With the voltmeter probe connected to the AFC test point, adjust the 45.75 MHz AFC coil (L1210) for the same DC reading as when connector 4M6 pin C is shorted to ground.
6. Disconnect the IF cable from the VHF/UHF tuner at the IF end. Apply 6 volts DC to the IF AGC test point (pin 13 of IC1201) to cut off the IF amplifier. Then adjust the Zero Carrier control (R1244) for 7.0 volts at CO (pin 16 of IC1201).

VERTICAL MODE

1. To "force" the vertical circuit to operate in the non-standard mode, remove shorting plug 5M, turn it 45° clockwise, and plug it back over the module pins. Use this position only for sources which have erratic vertical sync pulses, such as TV games, computers, or VCR's operating in the "special effect" modes.

Tuning voltages, low VHF, midband, high VHF, superband, hyperband, and UHF band switching voltages are applied to the tuner from the tuner control integrated circuit, IC6700. IC1 is a divide-by-64 integrated circuit which divides the oscillator signal for use by the phase-locked-loop (PLL) circuit inside IC6700.

TUNING SYSTEM

The tuning system in this TV Set is formed by four main circuits: keyboard, microprocessor with memory, display, and interface. These circuits are each described below.

Keyboard

The microprocessor senses which switch button is depressed on the keyboard by searching for continuity between IC6700 pins 20, 21, 22, and 10 through 14 plus 16 through 18. The keyboard consists of a three-by-seven matrix. When a switch closes, the proper response is initiated by the microprocessor.

Memory

The memory of the TV Set stores your favorite channels, which you program through the keyboard, so that you can scan the channels without reprogramming each channel after a power interruption. Audio volume information is also stored in the nonvolatile memory.

The nonvolatile memory is incorporated inside integrated circuit IC6700 together with a microprocessor and AFC comparators. The type of memory used is called "floating gate" because the memory cells contain essentially the same data as the cells in the random access memory (RAM) of the microprocessor. These cells are collectively known as the "shadow RAM." Information is written into the nonvolatile memory only when different data needs to be entered, and when a reset pulse at pin 28 occurs during the power down phase of the microprocessor, which is when the TV Set is being turned off. The reset pulse is generated by the collapse of the 18-volt supply. This pulse is generated just before the 5-volt supply to the microprocessor starts to decay, so that there is enough time to generate a "write signal" and transfer information from the normal RAM to the shadow RAM.

Display

The channel display is a green, 2-1/2 digit LED (light emitting diode). The hundreds digit is driven directly from pin 10 of IC6700, whereas the tens and units digits are driven by transistors Q6704 and Q6707 which, in turn, are controlled by voltages from pins 23 and 24 of IC6700. The display is multiplexed at a 500 Hz rate. The display is used to display channel number, band, and AFC information.

To light up a character, the microprocessor supplies a negative voltage to either Q6704, Q6707, or both. This allows the 5-volt supply to power the anodes of the display LEDs. Pins 11 through 14 and 16 through 18 of IC6700 are grounded in the appropriate combination to display the proper character.

Microprocessor and Interface

Crystal CR6700 sets the frequency of the internal 7.16 MHz oscillator between the XTAL IN and XTAL OUT pins. This oscillator provides the clock that is required for operation of the microprocessor and the reference frequency for the phase-lock-loop circuits contained in the microprocessor.

Pin 7 of IC6700 provides volume control information through driver transistor Q6700 to audio amplifier IC1451 at pin 8. The volume D/A (digital-to-analog) converter reference frequency is 20.8 kHz and provides very fine inaudible steps of volume change. These steps are filtered by resistor R6710 and capacitor C6706.

When a channel is selected, the microprocessor checks the state of the Band pushbutton and then obtains the required divide ratio for its ROM (read only memory). This causes the internal dividers to produce the required reference frequency for the PLL along with bandswitch information. The bandswitch logic is latched at outputs BS0 and BS1 of IC6700 and at A and B of interface IC6600. This allows the tuner control to select the proper band. Minimum tuning (clamp) voltage is also set for each band to prevent the tuner oscillator from stopping due to low tuning voltage.

Prescaler IC1 in the tuner divides the tuner oscillator frequencies by 64 before they are applied to the LFI input (pin 9) of the microprocessor. The microprocessor further divides this frequency and then

CIRCUIT DESCRIPTION

Refer to the Schematic Diagram while you read the following Circuit Description. Circuit components are identified with a combination letter-and-number callout. The letter describes the component; the number locates it in the TV Set and on the Schematic.

TUNER

INPUT

A single 75 Ω, combined VHF/UHF/CATV antenna input connnector is used on the receiver. In most cases, this eliminates the need for external splitters or matching transformers. The VHF/UHF tuner electronically selects the desired television signal from 178 channels of the regular VHF and UHF bands, as well as cable television.

VHF

The signal is routed to the VHF section by reverse biasing diodes CR1 and CR2. After passing through an FM band filter and a high-pass filter, the signal is tuned by varactor diode CR103 and inductors L106, L107, L104, L102 and L103, for low-, mid-, high-, super-, and hyper-band operation, and amplified by a dual-gate MOSFET at Q3. RF amplifier AGC is applied to GATE 2 of Q3 to control the gain of this stage.

The signal is then coupled through a double-tuned bandpass circuit, which consists of varactor diodes CR104, CR109, and inductors L112, L113, L114, L116, L117, and L118, to the mixer transistor Q4. Here the selected and amplified VHF signals are heterodyned with the signal from oscillator transistor Q6, which is tuned by varactor diode CR112. The resulting difference signal in the 41.25 to 45.75 MHz frequency range is then amplified by IF amplifier transistor Q5 and coupled to the tuner output connector through a tuned circuit consisting of L128 and C146.

UHF

The UHF signal is routed to the UHF tuner section by forward-biasing diodes CR1 and CR2. It is tuned by varactor diode CR3 and inductor L6 and amplified by RF amplifier transistor Q1. From the output of Q1, the signal is coupled through a double-tuned bandpass circuit, CR4/L11 and CR5/L12, to mixer diode CR7. Here, the signal is mixed with the signal from oscillator stage Q2 to produce an IF with a 45 MHz center frequency. This signal is then amplified by transistors Q4 and Q5, which are cascoded when the tuner is on the UHF band.

applies it to the PLL circuits. The PLL adjusts the duty cycle of a 1.95 kHz, 5 volt peak-to-peak output signal at PD0, pin 8. This signal is applied through resistor R6713 to pin 8 on the interface, IC6600. An operational amplifier that is connected between pins 7 and 8 is supplied by a 32-volt, 13.6-milliampere constant current source at pin 5 of IC6600.

A resistor/capacitor network provides feedback from the output at pin 7 to the input at pin 8 for filtering. The filtered DC tuning voltage at pin 7 is applied to the tuners and is adjusted to obtain and maintain phase lock between the oscillator and microprocessor-supplied reference frequency.

SIGNAL PROCESSING CIRCUITS

IF AMPLIFIER

The IF amplifier, detector, and AGC stages are connected internally in integrated circuit IC1201.

The signal from the tuner passes through a matching pad, C1226 and L1226, and then to the SWIF (surface wave intermediate frequency) filter. Because the input impedance of the first IF stage is almost purely resistive, it is similar to having the output of the SWIF filter tuned. The result is that less power is lost in the interface between the SWIF and the first IF amplifier stage.

The IF amplifier consists of five stages of amplification (all of the differential type). The grounded-base first stage produces a low impedance input. This stage has no AGC applied to it. The second, third, and fourth stages are conventional differential amplifiers. They contain variable emitter degeneration to produce about 23 dB of gain reduction per stage. This variable emitter degeneration is brought about by controlling the forward bias on a diode which parallels the emitter resistor.

The fifth stage is the output stage. Although the five stages are all operated differently, only one output is used in this stage.

The signal from the output amplifier stage, at pin 1 of IC1201, is divided by capacitors C1210 and C1211 to pin 28, where it is split internally two ways, one output goes to the synchronous detector and the other goes to the limiter.

The limiter stage collector circuit contains back-to-back diodes as the main limiting element. The limited signal is then sent to the phase detector. In addition, a part of the limiter output is used to drive the AFC circuitry. The signal that is applied to the phase detector is compared to its other input, which is the reference oscillator signal. When these two signals are 90° out-of-phase, the output of the stage is zero. At any other phase condition, the output will produce a beat note accompanied by a DC component. This signal is filtered, amplified, and then used to control the VCO reference oscillator.

The VCO signal is applied to the synchronous detector stage through a voltage-controlled phase shift stage. The variable phase shift control, R1213, lets you adjust the sync detector without affecting the limiter adjustment.

The video amplifier stage that follows the detector provides the correct levels for the two video outputs at pins 16 and 17 of IC1201. The signal that appears at pin 16 has been noise cancelled, and then inverted. This action takes place after it overcomes an offset voltage. An emitter follower output is fed to pin 17.

An internal 6-volt regulator functions as a shunt regulator, using a 5.3-volt zener diode as the reference to power the internal circuitry of IC1201.

AGC SYSTEM

The AGC function is included in the IC1201 circuitry, and the sync separator function is included with signal processing IC2376. Because of this separation of the sync/AGC circuits into separate ICs, an internal circuit is used to provide the function of AGC gate generation.

The AGC gating pulses are derived from the composite video signal at pin 17. Internally, the horizontal sync pulses are separated from the video signal and then used as gating pulses for the AGC

circuit. R1236 and C1251 at pin 14 of IC1201 form an AGC gate filter. Previously, gating pulses were derived from a horizontal flyback pulse. The advantages of using horizontal sync pulses for gating are that nonstandard TV signals from VCRs, video games, computers, decoded scrambled subscription signals, etc., will be processed faithfully, and the previous instabilities (such as vertical jitter), will be eliminated.

An internal AGC detector gates on from the derived pulses and samples the sync tip amplitude against a reference level determined by the AGC crossover point set at pins 12 and 13 of IC1201 by the associated resistors and control R1231. The functions of the IF amplifiers, synchronous detector, AGC detector, AGC delay, IF AGC amplifier, and the RF AGC amplifier are all incorporated into IC1201. The functions of the AGC detector are as follows:

1. AGC Detector — Samples the video during the sync period, and charges or discharges AGC filter capacitor C1227 to a voltage which represents the signal strength. The AGC voltage, via the AGC delay circuit, is applied to the VHF and UHF RF amplifiers.

2. AGC Delay — Adjusts the minimum IF amplifier gain and determines the threshold below which only the IF amplifier's gain is adjusted. Above this threshold, the RF amplifier is adjusted for maximum gain, and the IF amplifier remains at minimum gain.

Capacitor C1233 is connected between pins 12 and 13 of IC1201. For abrupt changes in signal strengths above the AGC threshold, this capacitor causes the IF amplifier to alter its gain and stabilize the video signal. During this transition, the RF amplifier's gain is not altered. After a time, the IF amplifier will return to its minimum gain and adjust to a new level which will correspond to the new signal strength.

VIDEO CIRCUITS

CHROMA

Input Section

The composite video signal is received from IF test point CV (composite video). The signal here requires modification for high frequency peaking. This function is performed by auto-transformer L2376, capacitors C2376 and C2377, and resistor R2376, which act as a highpass filter to remove low-frequency luminance components. This filter also sets the 3.1 and 4.1 MHz color components at approximately the same level. The autotransformer reduces the loading effects of the input capacitance of the IC on the tuned circuit formed by the above components. From the output tap of the autotransformer, the signal is capacitively coupled to pin 10 of IC2376 via capacitor C2381.

Automatic Color Control (ACC)

Pin 10 of IC2376 is connected to one terminal of a differential amplifier at the input of the ACC (or first chroma) amplifier. A differential amplifier is used so that the limiting characteristic will be symmetrical for good APC pull-in performance. The gain of the ACC amplifier is modulated by the DC voltage at pin 13 of IC2376, the ACC phase detector filter. The higher the voltage at pin 13, the higher the gain of the ACC amplifier.

The maximum gain of the ACC amplifier is approximately 6; but under normal signal conditions it runs at a gain of approximately 0.4. The reserve gain is used to make up for signal strength variations.

The color kill point is set for a nominal -32 dB level with about 2 dB hysteresis from kill to unkill. The nominal output of the ACC amplifier is a 100 millivolts peak-to-peak burst. This output is applied to a DC level shifting circuit, then to the APC and ACC phase detectors, and finally to the second chroma amplifier.

Second Chroma Amplifier

Since the output of the ACC amplifier is a single-ended signal, it is necessary to create a differential signal before it is applied to the APC and ACC phase detectors and the second chroma amplifier. This is done by applying the signal to a pair of resistors and then using capacitor C2378 at pin 15 of IC2376 to filter the chroma signal out at the end of one of the resistors. This yields a differential chroma signal with an equal DC bias level that can be applied to the input of the differential amplifiers of the phase detectors and the second chroma amplifier.

The Color Level control, the picture control functions, and the color killer are implemented here; however, the implementation is such that the pedestal created by the burst blanking is greatly reduced. The input to the second chroma amplifier is set at 100 millivolts peak-to-peak. This means that oversaturated colors are soft-clipped, with the resulting oversaturation removed. This is done regardless of the position of the Color Level control, since the soft-clipping is done at the input of the amplifier before the Color Level or picture controls. Whenever color kill is called for, the bias current is removed from the amplifier.

Vertical blanking is applied to the amplifier during the vertical retrace interval. The blanking signal comes from the sync/scan section of IC2376, the same as the luminance vertical blanking signal does. The color level control voltage is applied to pin 11 of IC2376. It controls the bias current of the amplifier and the picture control which is applied to the luminance section at pin 29. From there, it is transferred to the second chroma amplifier, which acts as a current steering amplifier. The DC level at the output of the amplifier (pin 12 of the IC) changes as the color level or picture control voltage changes, and whenever beam current limiting or color kill occurs.

Demodulators

The output of the second chroma amplifier is applied to the chroma bandpass network, which consists of C2389, L2378, and R2379. The signal is coupled into the demodulators at pin 21 via C2388. The demodulators are intended to run at a demodulation angle between B-Y and R-Y of 100° and a relative gain of 88 percent. The G-Y signal is again derived by matrixing (B-Y) and -(R-Y), with the gain and angle of the G-Y, relative to B-Y of 22 percent and -105° respectively. The outputs of the R-Y and B-Y demodulators and the G-Y matrix are added to luminance, with the resulting R, B, and G signals leaving the IC at pins 26, 27, and 25 respectively.

Automatic Tint Guard (ATG)

In the second chroma amplifier, the burst was blanked. This means that it is possible to measure the no-signal current in the demodulators during the horizontal blanking interval. With the appropriate mixing of the R-Y and B-Y demodulators' outputs, the -I component of the color signals can be measured. If the -I component of the color signal is compared to the no-signal condition of the demodulators, it is possible to determine when a flesh tone signal is present. This comparison can, in turn, be used to activate the auto-tint correction circuitry. The sampled no-signal condition voltage is held on sample-and-hold capacitor C2384.

When the -I detector detects a -I signal, the gain of the B-Y demodulator is reduced. If this were done alone, colors in the +I half of the color difference plane would be corrected toward R-Y. Since the desire is to correct to flesh tone, the instantaneous DC level of the B-Y demodulator is shifted in a negative direction. This gives the effect of moving the preference angle of the ATG for the R-Y to flesh tone.

Automatic Phase Control (APC)

The burst input to the detector comes from the level shift stage at the output of the ACC amplifier.

The VCO signal for the detector comes from the -90° input of the VCO. It is buffered and DC level shifted to be compatible with the 8-volt supply. The output at pin 17 of the APC detector is filtered by the APC loop filter, R2358, C2382, and C2393. The DC adjustment voltage for the VCO is also applied to this pin.

Because the connection between the ACC amplifier and the ACC/APC/second chroma amplifier is all internal to the IC, it is impractical to remove the burst signal from the phase detectors by AC grounding. However, the feedback from the phase detector to the VCO must be removed in some fashion in order to set the correct free-running frequency of the VCO. Because of this requirement and the internal coupling from the ACC amplifier, the IC was designed to turn off the phase detector for VCO setup. This is accomplished by connecting pin 9, the ATG sample-and-hold capacitor pin, to 8 volts. When the voltage at pin 9 is increased to 8 volts, the chroma input signal to the detector is removed and replaced with a "dummy" DC voltage. This lets you set up the VCO by adjusting control R2390. With this setting, the VCO has a much smaller "false-lock" range, thus allowing a more accurate setting of the VCO's free-running frequency.

Automatic Color Control (ACC)

The ACC detector is a double-balanced mixer. The ACC error voltage at its output is added to the loop's offset voltage and then applied to IC2376, pin 13, where it is filtered by capacitor C2362. The filtered error-plus-offset voltage is then applied to the ACC amplifier in order to close the loop. As with the APC detector, the ACC detector is disabled during the VCO set-up procedure. A fixed voltage is applied to pin 13, and thus to the ACC amplifier, during setup so you will be able to see the color signal.

Because the ACC amplifier is direct-coupled to the second chroma amplifier, it is necessary to pass the signal through the whole chroma processing chain. By applying a fixed voltage to the ACC amplifier, it is possible to pass the chroma signal through the second chroma amplifier while the color killer is disabled. This makes the color level on the CRT controllable by the picture and color level controls.

Voltage Controlled Oscillator (VCO)

The VCO output at pin 16 and the "R input," which is phased at approximately -45° from B-Y, is applied to pin 19. Internally, there are level shifting stages from the inputs of the VCO to the tint control, and the APC and ACC phase detectors.

Tint Control

The in-phase and quadrature signals are taken from the VCO through DC level shifters. The two signals are used to generate the four quadrature signals used for the tint control steering matrix. After matrixing, the signals spread in angle to 100°. They are then applied to the demodulators. The level of the difference signal that is applied to the demodulators is approximately 1 volt peak-to-peak. The control voltage for the steering matrix is applied to the IC at pin 20. The tint range is designed for a total swing of 90°.

LUMINANCE CIRCUIT

The input to the luminance circuitry at pin 34 of IC2376 is driven by a 1.5 volt peak-to-peak video signal from delay line L2276. The input signal is internally buffered and drives a series RLC network used to derive the peaking and low-pass luminance signal.

A second signal, called the "f" signal, is produced across inductor L2277 of the RLC network, which is connected between pins 22 and 23 of the IC. This bidirectional pulse is used as the preshoot/overshoot peaking signal. The low-pass luminance signal "f" appears across capacitor C2282 at pin 22. The internal circuitry of the IC can process the common mode luminance and differential mode peaking signals separately. This adds a variable amount of the peaking signal back to the luminance to control the picture sharpness.

The peaking signal is added to the luminance signal inside IC2376. Under minimum peaking conditions pin 24 is at 8 volts, and all the internal signal processing transistors conduct equally. In this state, the positive and negative peaking signals cancel each other and no peaking signal is present in the luminance signal at the video output. As the

voltage at pin 24 is decreased, the additive process is decreased, while the amount of peaking signal present in the luminance at the video output increases.

The automatic brightness limiter circuitry is also internal to IC2376 and controls the gain of the video circuitry. With no current passing through the tertiary winding of the high voltage transformer into the CRT anode, the voltage at pin 35 of the IC is normally 4.8 volts. This voltage is determined by a resistive divider network. As current starts to enter the anode of the CRT, current is drawn from the junction of resistors RX3217 and RX3233. As the anode current increases, the voltage at pin 35 of the IC, which operates the internal picture control circuitry, decreases. This results in a reduction of the video gain and anode current. When the voltage at pin 35 decreases to approximately 4.5 volts, the peak-to-peak level of the video signal starts decreasing. As the voltage continues to decrease below about 3.7 volts, the black level of the video signal will also decrease, thus decreasing the anode current.

VIDEO OUTPUT AMPLIFIERS

The video output amplifier uses a cascode circuit whose transistors Q5100, Q5101, and Q5102 drive the CRT cathodes through transistors Q5103 (blue), Q5104 (red), and Q5105 (green). Adequate frequency response is obtained by peaking inductor L5100, which provides video peaking in the 2 to 3 MHz range. The bases of the output amplifier transistors are connected together and are biased from the 12-volt supply through R5141.

Transistors Q5100, Q5101, and Q5102 are common-emitter amplifiers used to amplify the red, green, and blue signals. They drive the video output transistors. Video peaking is provided by capacitors C5103, C5104, and C5105. Gain adjustment is provided by controls R5112, R5113, and R5114. Resistors R5124, R5125, and R5126, and spark gaps E5100, E5101, and E5102 act as arc suppressors.

SYNC CIRCUITS

SYNC SEPARATION

Composite Sync Separation

In a conventional sync separation circuit, the sync slice is established by a proper selection of charge current to discharge current ratio in the sync filter. The sync filter stores the DC voltage against which the sync slicer compares the video and separates the sync from the video signal. The ratio of charge current to discharge current of the sync filter is the same as the ratio of sync time to active video plus front and back porch time. However, during vertical sync period, the syncs are broad pulses; therefore, the ratio of charge current to discharge current must be modified. This requires that the sync filter should have a dual time constant; one for the horizontal pulses and the other for wide pulses during vertical sync.

In IC 2376, a charge time constant equalizer and a discharge time constant equalizer is used to normalize the pulse widths of the wide pulses to that of the horizontal sync signal. This eliminates the need for the dual time constant and reduces the number of discrete components required for the sync filter from six to one disc capacitor.

Vertical Sync Separation

The digital vertical sync generation system uses three counters: G, H, and L. The G counter serves two functions. Prior to the vertical sync detection, it detects the presence of wide pulses in the composite sync. This is accomplished by counting the clock pulses that correspond to the 1.79 MHz signal during the composite sync period. The first wide pulse is detected after only a 6 µs wide pulse period. This starts a time interval which terminates after a 254 µs period for four horizontal lines. If vertical integration does not occur in this time interval, the counter proceeds to count to 833 and then stops. During this time interval, the G counter is reset every horizontal period rather than the usual half horizontal period. The 12 µs wide pulses are also detected.

The I counter counts the number of 12 µs wide pulses during the 4H line time interval. As soon as two 12 µs wide pulses are detected during the time interval, the integrated vertical sync is generated

by the I counter. The leading edge of the integrated vertical sync occurs at the instant the second 12 µs wide pulse is detected by the G counter; the trailing edge occurs at the end of the 833rd count of the G counter. If two 12 µs wide pulses are not detected by the G counter, the I counter does not generate vertical sync and the I counter is reset at the end of the time interval, which now is 4H lines wide.

The second function of the G counter is to generate a nonstandard vertical drive pulse of a fixed known pulse width. The pulse width of the nonstandard vertical drive pulse has been selected to be about 7H lines wide, which is the 833rd count of the G counter. The G counter, which normally is reset at every half or full horizontal line period, now does not reset until the 833rd count, and the time interval ends.

VERTICAL SCAN PROCESSING

IC2376 provides a vertical ramp. The Height control, which is applied to pin 3 of this IC, controls its amplitude. The vertical ramp is synchronized to the vertical sync by the vertical countdown counter and its associated logic circuitry. The mode recognition logic in this IC is such that in the absence of vertical sync, which happens when the video signal is very weak, the vertical ramp is generated by 525 counts at twice the horizontal frequency.

HORIZONTAL SCAN PROCESSING

The horizontal scan frequency is determined by an RC (master scan) oscillator which oscillates at a rate of 251.75 kHz. The free running frequency of the RC oscillator is automatically tuned to 15,734 Hz ±60 Hz. A horizontal phase detector is disabled for six horizontal lines during the vertical sync interval. During this time, the frequency of the RC oscillator is compared with a reference pulse derived by counting down the color oscillator signal which operates at a frequency 227.5 times the horizontal scanning frequency.

If an error is detected in the RC oscillator's frequency, the up/down counter's state is altered and a correction voltage is algebraically added to the oscillator's bias to corrrect the frequency.

The output of the 251.75 kHz oscillator is divided by eight to obtain 31.468 kHz, which is phase adjusted by the picture centering circuit. The phase-adjusted 31.468 kHz signal is divided by two to obtain a 15.734 kHz signal, which is applied to the second horizontal phase detector, where it is compared with the horizontal flyback pulse at pin 32. The error signal from the second phase detector is used to modify the phase of the horizontal signal. The modified signal is used for the horizontal drive output at pin 37.

DEFLECTION CIRCUITS

HORIZONTAL START-UP CIRCUIT

Transistors Q3224 and Q3213, capacitors C3213 and C3224, and resistors R3212, R3213 and R3215 are connected as an astable multivibrator. The output of this circuit, at the collector of Q3224, is connected through diode CR3216 to the primary winding of the horizontal driver transformer TX3205. When the TV Set is turned on, the horizontal sweep transformer provides the isolated power supply voltages so the regular horizontal drive circuit can take over the function of the multivibrator.

The start-up multivibrator is controlled by a two-transistor circuit consisting of transistors Q3211 and Q3210. This circuit detects the rising 123-volt DC power supply voltage at the time the TV Set is turned on, which then starts the multivibrator. After a time delay, this circuit turns the multivibrator off.

Horizontal Drive

The horizontal drive signal is provided at pin 37 of IC2376. This signal is a square wave with a 50% duty cycle at the horizontal scan frequency of 15.734 kHz.

The positive portion of the square-wave signal switches on transistor Q3209, which inverts the signal. The positive portion of this inverted signal switches on transistor QX3202, which again inverts the square-wave signal. The drive signal is then applied to the base of horizontal driver transistor Q3206. As this transistor is switched on or off, its collector voltage goes low or high at the horizontal scan rate. This varying voltage is transformer-coupled through TX3205 to produce a high-current/ low-voltage drive signal to switch horizontal output transistor QX3208 on or off.

Horizontal Output

When transistor QX3208 is in saturation, current from the 123-volt DC supply passes through QX3208, the primary winding of sweep transformer TX3204, through resistor RX3261, and back to the supply. The same voltage also produces a current in the horizontal windings of the deflection yoke through capacitor C3261, causing the electron beam in the CRT to be deflected to the right from the center of the screen.

At the end of the square-wave drive pulse, transistor QX3208 quickly turns off and current stops passing through TX3204 and the horizontal windings of the deflection yoke. This causes the stored magnetic field in the yoke windings and sweep transformer to collapse, inducing a reverse current through TX3204 and capacitors CX3231, CX3228, and CX3229. This reverse current causes a very rapid deflection of the electron beam (retrace) to the left side of the CRT. After the magnetic field collapses, the electron beam moves back to the center of the CRT. The energy stored in C3261 during retrace time is routed through the damper diode contained inside QX3208, causing the deflection. By this time, another square-wave pulse switches QX3208 on, and the process is repeated.

High Voltage

When the magnetic field around TX3204 and the horizontal deflection yoke collapses, a very high voltage is induced into the secondary windings of TX3204. This voltage is rectified to an 18 kV DC potential through four series-connected transformer windings and two diodes, which are inside the flyback transformer. This high voltage is connected to the anode socket of the CRT. A portion of this high voltage is divided by a series connection of two resistors and two controls to provide focus and screen (G2) voltages for the picture tube.

VERTICAL DEFLECTION AMPLIFIER

The vertical drive sawtooth waveform is supplied by IC2376. Pin 42 of this IC supplies the needed sawtooth signal by charging and discharging capacitor C2118. The circuit at pin 3 of IC2376 is used to vary the raster height by altering the magnitude of the signal that forms the sawtooth drive waveform on capacitor C2118.

After the vertical drive signal has been generated, it is processed by IC2100. This IC contains a power amplifier for directly driving the vertical windings of the deflection yoke.

The vertical output signal is at pin 5 of IC2100. The series connection of RX2106 and C2130 on the output pin suppresses high-frequency oscillations. The yoke current is sampled by resistor RX2147 and then coupled by C2152 and C2131 back to pin 1 of IC2100. Resistors R2111 and R2112 provide a DC component to the feedback and enable small amounts of shaping to be introduced into the feedback signal for linearity correction. Resistors R2148 and R2149 are used for damping out ringing on the vertical waveform, which may otherwise be present at the start of the trace. Resistors R2105 and R2110 are also in the feedback circuitry for linearity correction.

After the yoke current has reached a maximum value and begins to decrease, the retrace begins. During flyback (retrace), IC2100 initiates a voltage doubling action with capacitor C2149 connected between pins 3 and 6. This flyback generator circuitry results in the connection of the negative side of capacitor C2149, pin 2, to the 18-volt supply at pin 2 during retrace. Since capacitor C2149 was fully charged before retrace, its positive terminal now goes to approximately 35 volts above ground. Diode CR2149 keeps capacitor C2149 from discharging into the 18-volt supply, and results in the output stage supply at pin 6 operating from a 35- volt supply. A reversal of the yoke current occurs during retrace time. When the yoke current reaches its proper value, the circuit is ready to begin another trace period.

SOUND PROCESSING

AUDIO

The 4.5 MHz sound IF signal from pin 16 of IC1201 is coupled through ceramic filter U1402 to pins 1 and 2 of IC1451. This IC contains the following circuits: an IF amplifier/limiter, an FM detector, an electronic attenuator, an audio amplifier, and a regulated power supply.

The IF amplifier/limiter amplifies the incoming signal to the point of limiting so that any noise exceeding the limiting point is removed. The output of the IF amplifier is coupled to one input of the FM detector. The other input to the dectector is provided by inductor L1426 and capacitor C1426, which make up a quadrature-tuned circuit. This circuit is adjusted to give a 90° phase shift at the 4.5 MHz center frequency of the FM signal. A variation of the input frequency causes a change in the phase shift of the tuned circuit, which produces an output voltage. This output voltage is directly proportional to the shift of the input frequency from the center frequency. Thus, the IF signal is converted to audio. The audio signal is then processed by deemphasis capacitor C1463 at pin 16 of the IC and Tone control capacitors C1455 and C1457 at pin 10

The sound volume is controlled by a DC control voltage being supplied to the electronic attenuator at pin 8. Audio signals from the electronic attenuator are then coupled to the audio output circuit, which further amplifies the signal. The output at pin 11 of IC4151 is coupled to the speaker through capacitor C1451 to connector 4P4.

The audio circuit also contains a sound mute circuit, which is designed to mute distorted audio present as the TV Set is being turned off. Mute transistor Q1455 functions in a manner similar to the equivalent circuit of a zener diode and a back-biased conventional diode when the TV Set is operating. When the TV Set is on, capacitor C1466 across resistor R1462 charges to approximately 11.5 volts through the emitter-base junction of Q1455 and remains charged while the TV Set is operating. When the TV Set is turned off, the 18-volt supply voltage decays rapidly to zero volts. The capacitor, which was charged to approximately 11.5 volts, now discharges and drives the base of the transistor to a potential of about -.7 volt. This causes the collector-base junction of the transistor to become forward-biased, pulling pin 2 of IC1451 negative to effect the muting action.

POWER SUPPLY

AC POWER SUPPLY

The neutral side of the AC line is connected to connector 3R8, pin 3. From there, the line current passes through AC line filter TX3298 and connects to the anode of CRX3271 and the cathode of CRX3272. The hot side of the AC line is connected to pin 1 of connector 3R8. The line current passes through fuse FX3299, the other winding of AC line filter TX3298, and then to the Off/On switch via connectors 3S8, pin 2, 8S3, pin 2, and 3Z7, pin 2. From the Off/On switch, the hot side returns through connectors 3Z7, pin 1; 8S3, pin 3; 3S8, pin 1; and on to the anode of diode CRX3273 and the cathode of CRX3274.

The four diodes are connected in a bridge circuit and rectify the AC line voltage to produce 150 volts DC, which is filtered by capacitor C3249. Spark gap EX3201 is connected across the AC line to dissipate any high voltage surges which may be on the line due to lightning, or due to inductive kick from motors, transformers, etc.

SERIES PASS REGULATOR IC

The 123-volt main power supply, which powers the sweep circuit, is regulated by series pass integrated circuit ICX3202, a hybrid device. It contains a Darlington power transistor along with a voltage sensing circuit and an error amplifier.

The internal power transistor is connected in parallel with high-wattage resistor RX3205, which reduces the power dissipation in the regulator. A network of parts is also connected to the base of the Darlington transistor to bias it and to provide two kinds of filtering to the output voltage.

Capacitor CX3202 filters the ripple from the 150-volt input supply to the base of the Darlington transistor. For low AC line operation, the input circuit at pin 2 of ICX3202 has a resistive divider consisting of RX3201 and R3207 that drops the 150-volt input voltage. The output of the transistor is always lower than the 123-volt input, and the input ripple voltage is not passed to the 123-volt output of the regulator.

LOW-VOLTAGE SUPPLIES

All of the low-voltage power supplies are derived from the 18-volt tap of the horizontal sweep transformer. For 12-volt series pass-transistor Q3437, the 18-volt power supply is dropped across resistor RX3464, which is also part of the 5-volt power supply to be described later.

The voltage at the output of Q3437 is sensed by zener diode CR3467; any error voltage detected is amplified by transistor Q3436 and applied to the base of regulator Q3437 to keep the output of the 12-volt regulator constant.

The 8-volt regulator is also a series pass-transistor operating from the 18-volt source. Zener diode CR3409, which is biased from the 12-volt supply through resistor R3404, serves as a 7.4-volt reference supply connected to the emitter of transistor Q3403. The collector of Q3403 drives the base of series pass-transistor Q3401. If the 8-volt output voltage attempts to drop, transistor Q3403 conducts less, causing the base voltage of Q3401 to rise. This, in turn, causes Q3401 to conduct more and increases the 8-volt supply. The opposite takes place when the 8-volt supply voltage rises.

The 5-volt source employs a shunt-type regulator. The 12-volt supply voltage is reduced to 5 volts by resistor RX3200. Transistor Q3200 shunts current to ground to produce the proper voltage drop across R3200. Any variation in the 5-volt source is sensed by zener diode CRX3200 and applied to the base of shunt transistor Q3200. Resistors R3262, R3263, and R3267 between the collector of Q3200 and the 5-volt source reduce the power dissipation in Q3200.

DC/AC CONVERTER

With the 12-volts DC source connected to input socket 3Y7 and the Off/On switch in the on position, startup takes place as follows: 12 volts DC appears on pin 1 of transformer T1 and on the positive side of C10. This charges capacitor C10 through the base-emitter junction of Q1. This charging current provides the positive bias for Q1 as the collector current starts to increase. The bias winding connected to pins 5 and 6 increases the base drive until Q1 is saturated. A second winding connected to pins 11 and 12, and placed in the emitter of Q1, speeds up the switching of transistor Q1 and reduces the switch's losses in the transistor.

The phasing of both base and emitter windings is such that when the voltage at pin 1 of T1 goes positive, the voltage at pin 11 of T1 goes negative. By generating the start-up bias voltage during the charging of capacitor C10, no charging will be possible in case of a temporary short circuit, which will stop the oscillator.

The flyback voltage is taken from the collector of Q1 through C13; then this voltage is rectified by CR11 and filtered by C11 to provide bias voltage for the series regulator. This is done to limit the normal 123-volt B+ supply voltage from rising too high when the 12-volt DC input voltage increases. The peak-to-peak flyback voltage is controlled by placing capacitor C4 between pins 1 and 7 of the auto-transformer windings.

The 123-volt source voltage is generated by the forward transfer of energy, and not the flyback voltage. CR2 rectifies the voltage which charges filter capacitor C5 to 123 volts. This voltage is fed through blocking diode CR11 via connector 3E3.

Degaussing Circuit

The flyback voltage is used to generate approximately 600 volts DC for the degaussing circuit.

Diode CR3, in series with limiting resistor R3, charges capacitor C6 to approximately 600 volts. With the degaussing coil connected to connector 3T8, the path is now completed to SCR Q3 with CR5 serving as the commutating diode.

SCR Q3 is fired after approximately a 3-second delay to allow capacitor C6 to be charged. The delay circuit is made up of C8, R7, R6, Q2, CR6, and R4. C7 and R5 present a low impedance for the SCR gate to prevent firing due to noise. Zener diode CR6 generates a stable 12-volts supply via bias resistor R8. At the same time, capacitor C8 charges slowly through R7 and R4. Initially, the voltage at the base of Q2 is positive with respect to the emitter keeping the transistor cut off. As the charge in C8 builds up, the voltage at the base of Q2 will go more negative until Q2 turns off. This provides positive bias to the gate of Q3 limited by R6. Once the SCR has turned on, it will remain on for the duration of the TV Set's playing time. During this time, the 600-volt DC potential will appear across R3.

During AC line operation, the degaussing voltage is line generated with half-wave doubler CR7 and C9. This voltage is approximately 320 volts. Diodes CR4 and CR9 are blocking diodes. CR4 isolates the 120-volt line voltage from the 12-volt source; CR9 blocks the degaussing voltage from appearing at C9 and CR7.

CONVERGENCE

CROSSHATCH GENERATOR

The crosshatch generator provides a crosshatch pattern for use during convergence and purity adjustments.

The vertical high signal from IC2100, pin 5, on the main module is shaped and amplified by transistor Q901 and IC U901D to provide square-wave pulses during vertical retrace. Horizontal retrace pulses from the main module at point E are shaped and amplified by transistor Q904 and IC U901A to provide square-wave pulses during horizontal retrace.

Horizontal lines on the screen are generated by dual up-counter IC U902. Vertical pulses at pins 7 and 15 reset the counters. After reset, horizontal pulses applied to pin 1 are counted. Every twentieth horizontal pulse causes pins 6 and 14 to become a logic high for one horizontal line time. Diode D901 and transistor Q905 are turned on, which applies the positive pulse at L2288 on the main module. This turns on the video output transistors and produces a white horizontal line on the screen. Since two vertical fields make up one vertical frame, a line is produced in each field and appears as a double line.

The vertical lines on the screen are generated by U903, an edge-triggered multivibrator, which is connected as a resettable, astable multivibrator. Transistors Q902 and Q903 invert the vertical and horizontal pulses, respectively, which are then applied to U903 pins 3 and 13 to reset the multivibrator. Reset is also applied through resistor R918 to U901B pin 5. This reset operation causes the output of U903 pins 7 and 9 to be logic high. A very short time later, the reset pulse (whose time constant is determined by resistor R918 and the input capacitance of U901), is removed. Pin 5 of U901 becomes logic high and produces a logic low at IC U901 pin 4, and at the negative trigger input (pin 11) of one-half of U903. Pin 9 of U903 becomes logic low for approximately .4 µs (as determined by resistor R917 and capacitor C903). The logic low at pin 9 causes diode D902 to conduct, which produces a white vertical line on the screen in the same manner that the horizontal lines were produced.

When pin 9 returns to logic high, the rising edge of the waveform triggers the positive trigger input to the other half of the multivibrator. This causes U903 pin 7 to become logic low for approximately 4 µs (as determined by resistor R916 and capacitor C902). At the end of this period, when pin 7 goes back to logic high, U903 is again triggered at pin 11, and the process repeats. The vertical pulse applied to pins 3 and 13 of U903 prevents the multivibrator from operating during the vertical retrace.

With the Normal/Crosshatch switch in the Normal position, no load is connected to the 18-volts DC supply. In the Crosshatch position, 18 volts DC from point F is supplied through resistor R921 to zener diode D905, which produces 16 volts DC for crosshatch operation.

REPLACEMENT PARTS LIST

All of the part numbers in this list are Zenith part numbers. You may order these parts from your local ZENITH TV service center. Refer to your yellow pages for the location of your nearest Zenith dealer. NOTE: Heath Company Does Not Stock Zenith Parts and does not cross- reference the numbers.

This combined parts list will enable you to more easily determine the part number of parts used on each assembly, module, or chassis.

KEYBOARD ASSEMBLY (A-13924-1)

CIRCUIT Comp. No.	ZENITH Part No.	DESCRIPTION
DIODES		
CR6000	75-43	LED DISPLAY MODULE
CR6001	103-393	HIGH FREQUENCY
CR6002	103-393	HIGH FREQUENCY
CR6003	103-393	HIGH FREQUENCY
CR6004	103-393	HIGH FREQUENCY
CR6005	103-393	HIGH FREQUENCY
CR6006	103-393	HIGH FREQUENCY
CR6007	103-393	HIGH FREQUENCY
CR6008	103-393	HIGH FREQUENCY
RESISTORS		
R6000	63-10979-23	91 Ω 5% 1/8W FILM
R6001	63-10979-23	91 Ω 5% 1/8W FILM
R6002	63-10979-23	91 Ω 5% 1/8W FILM
R6003	63-10979-23	91 Ω 5% 1/8W FILM
R6004	63-10979-23	91 Ω 5% 1/8W FILM
R6005	63-10979-23	91 Ω 5% 1/8W FILM
R6006	63-10979-23	91 Ω 5% 1/8W FILM
R6007	63-10979-23	91 Ω 5% 1/8W FILM
SWITCHES		
SW6000	85-1691	SKIP PUSHBUTTON
SW6001	85-1691	SEARCH/ FIXED PUSHBUTTON
SW6002	85-1691	BAND PUSHBUTTON
SW6003	85-1691	(1) PUSHBUTTON
SW6004	85-1691	(6) PUSHBUTTON
SW6005	85-1691	(2) PUSHBUTTON
SW6006	85-1691	(7) PUSHBUTTON
SW6007	85-1691	(3) PUSHBUTTON

CIRCUIT Comp. No.	ZENITH Part No.	DESCRIPTION
SWITCHES (Cont'd)		
SW6008	85-1691	(8) PUSHBUTTON
SW6009	85-1691	(4) PUSHBUTTON
SW6010	85-1691	(9) PUSHBUTTON
SW6011	85-1691	(5) PUSHBUTTON
SW6012	85-1691	(0) PUSHBUTTON
SW6013	85-1691	ENT PUSHBUTTON
SW6014	85-1691	VOL UP PUSHBUTTON
SW6015	85-1691	VOL DOWN PUSHBUTTON
SW6016	85-1691	CHANNEL UP PUSHBUTTON
SW6017	85-1691	CHANNEL DOWN PUSHBUTTON
SW6018	85-1691	OFF/ON PUSHBUTTON
JUMPER		
W1	63-10979	ZERO Ω 5% 1/8W LEADLESS FILM
CABLES		
6A7	50-M2S-00025	CABLE AND CONNECTOR HOUSING
6A7	50-M2S-00072	CABLE AND CONNECTOR HOUSING
6B7	50-M2S-00026	CABLE AND CONNECTOR HOUSING
6B7	50-M2S-00111	CABLE AND CONNECTOR HOUSING
MISCELLANEOUS COMPONENTS		
	46-10460	PUSHBUTTON KNOB ARRAY
	46-10461	PUSHBUTTON KNOB ARRAY
	46-10462	PUSHBUTTON KNOB ARRAY
	64-1032	GRIPLET
	82-351	GROUND PLATE

MAIN MODULE (9-468)

CAPACITORS

CIRCUIT Comp. No.	ZENITH Part No.	DESCRIPTION
C1203	22-8031-02	2200 pF 20% 50V CERAMIC (CER) TUBULAR (TUB)
C1206	22-7861-05	10 µF 20% 35V ELECTROLYTIC (ELECT)
C1207	22-8031-02	2200 pF 20% 50V CER TUB
C1209	22-7613-12	1000pF 10% 50V DISC
C1210	22-7743-15	13pF 5% 50V TUB
C1211	22-8035-30	56pF 5% 50V CER TUB
C1213	22-8033-04	2.2pF 10% 50V CER TUB
C1215	22-8034-23	30pF 5% 50V CER TUB
C1216	22-7621-27	51pF 5% 50V DISC
C1217	22-7621-27	51pF 5% 50V DISC
C1219	22-8036-09	5.6pF 10% 50V CER TUB
C1222	22-8033-04	2.2pF 10% 50V CER TUB
C1225	22-8030-10	1000pF 10% 50V CER TUB
C1226	22-8034-21	24pF 5% 50V CER TUB
C1227	22-8048-27	0.18 µF 5% 50V POLYESTER (POLY)
C1229	22-7751-36	100pF 5% 50V TUB
C1230	22-7861-25	6.8 µF 20% 35V ELECT
C1233	22-0849-24	0.10 µF 10% 50V POLY
C1235	22-7774-08	0.0047 µF 10% 100V POLY
C1240	22-8030-01	180pF 10% 50V CER TUB
C1241	22-8035-32	68pF 5% 50V CER TUB
C1242	22-8030-10	1000pF 10% 50V CER TUB
C1243	22-8049-24	0.10 µF 10% 50V POLY
C1251	22-8049-24	0.10 µF 10% 50V POLY
C1426	22-7631-35	120pF 5% 50V DISC
C1427	22-8050-20	0.047 µF 20% 50V POLY
C1429	22-8050-20	0.047 µF 20% 50V POLY
C1451	22-7859-10	220 µF 20% 16V ELECT
C1452	22-7862-01	1 µF 20% 50V ELECT
C1453	22-8034-11	8.2pF 10% 50V CER TUB
C1455	22-8030-02	220pF 10% 50V CER TUB
C1456	22-7739-28	0.22 µF 10% 100V POLY
C1457	22-8030-10	1000pF 10% 50V CER TUB
C1459	22-7860-10	220 µF 20% 25V ELECT
C1460	22-7860-06	22 µF 20% 25V ELECT
C1461	22-8050-20	0.047 µF 20% 50V POLY
C1462	22-7860-08	47 µF 20% 25V ELECT
C1463	22-8049-10	0.0068 µF 10% 50V POLY
C1466	22-7861-05	10 µF 20% 35V ELECT
C2118	22-8048-32	0.47 µF 5% 50V POLY
C2124	22-8049-12	0.010 µF 10% 50V POLY
C2125	22-7861-09	100 µF 20% 35V ELECT
C2130	22-7740-28	0.22 µF 20% 100V POLY
C2131	22-7858-08	47 µF 20% 10V ELECT
C2148	22-7860-13	1000 µF 20% 25V ELECT
C2149	22-7861-09	100 µF 20% 35V ELECT
C2152	22-7858-06	22 µF 20% 10V ELECT
C2171	22-7860-09	100 µF 20% 25V ELECT
C2250	22-8049	0.0010 µF 10% 50V POLY
C2251	22-7862-01	1 µF 20% 50V ELECT
C2252	22-7858-06	22 µF 20% 10V ELECT
C2253	22-8030-10	1000pF 10% 50V CER TUB

CAPACITORS (Cont'd)

CIRCUIT Comp. No.	ZENITH Part No.	DESCRIPTION
C2254	22-7862-01	1 µF 20% 50V ELECT
C2257	22-8030-10	1000pF 10% 50V CER TUB
C2280	22-7862-01	1 µF 20% 50V ELECT
C2281	22-7862-01	1 µF 20% 50V ELECT
C2282	22-7621-34	100pF 5% 50V DISC
C2355	22-7621-27	51pF 5% 50V DISC
C2356	22-8023-34	33pF 5% 50V CER TUB
C2358	22-8030-10	1000pF 10% 50V CER TUB
C2359	22-8033-13	11pF 5% 50V CER TUB
C2362	22-7862-24	1.5 µF 20% 50V ELECT
C2365	22-7859-09	100 µF 20% 16V ELECT
C2376	22-7631-30	75pF 5% 50V DISC
C2377	22-7631-29	68pF 5% 50V DISC
C2378	22-8049-24	0.10 µF 10% 50V POLY
C2381	22-7742-10	1000pF 10% 50V TUB
C2382	22-7862-24	1.5 µF 20% 50V ELECT
C2384	22-7862	0.47 µF 20% 50V ELECT
C2385	22-8030-10	1000pF 10% 50V CER TUB
C2388	22-8030-10	1000pF 10% 50V CER TUB
C2389	22-7621-23	36pF 5% 50V DISC
C2390	22-7859-09	100 µF 20% 16V ELECT
C2393	22-8050-24	0.10 µF 20% 50V POLY
C2701	22-8049-24	0.10 µF 10% 50V POLY
C2704	22-8030-10	1000pF 10% 50V CER TUB
C2707	22-8049-14	0.015 µF 10% 50V POLY
C2710	22-8030-07	560pF 10% 50V CER TUB
C2715	22-7862-01	1 µF 20% 50V ELECT
C2726	22-7859-05	10 µF 20% 16V ELECT
C2727	22-7669-11	0.47 µF 10% 50V ELECT
C2730	22-8030-06	470pF 10% 50V CER TUB
C2731	22-7406-01	1 µF 20% 35V NP ELECT
C2733	22-8030-02	220pF 10% 50V CER TUB
C2741	22-8030-10	1000pF 10% 50V CER TUB
C2742	22-8049-16	0.022 µF 10% 50V POLY
C2745	22-8036-37	120pF 5% 50V CER TUB
C2746	22-8048-15	0.018 µF 5% 50V POLY
C2752	22-8039-03	10,000 pF 20% 25V CER TUB
C3200	22-8050-24	0.10 µF 20% 50V POLY
CX3201	22-7861-04	4.7 µF 20% 35V ELECT
CX3202	22-7962-14	33 µF 20% 200V ELECT
C3203	22-8049-26	0.15 µF 10% 50V POLY
CX3205	22-7962-14	33 µF 20% 200V ELECT
C3209	22-7786-10	.001 µF 10% 500V DISC
C3210	22-7878-14	0.15 µF 20% 250V POLY
C3211	22-7777-16	0.022 µF 10% 200V POLY
C3213	22-7777-11	0.0082 µF 10% 200V POLY
C3214	22-7857-09	100 µF 20% 6.3V ELECT
C3215	22-7786-10	470pF 10% 500V DISC
CX3219	22-7862-01	1 µF 20% 50V ELECT
CX3222	22-8063	530p 10% 3KV DISC
C3223	22-8049-20	0.047 µF 10% 50V POLY
C3224	22-7786-01	220pF 10% 500V DISC
CX3225	22-7431-06	0.0047 µF +20 % -20 % DISC
CX3228	22-7672-34	.0027 µF 5% 1600V POLYPROPYLENE

CIRCUIT Comp. No.	ZENITH Part No.	DESCRIPTION
CAPACITORS (Cont'd)		
CX3229	22-7672-34	.0027 µF 5% 1600V POLYPROPYLENE
CX3231	22-8063	530pF 10% 3KV DISC
C3233	22-7128	0.68 µF 10% 200V POLY
C3249	22-7908-02	470 µF 20% 200V ELECT
	12-9341	METAL STAMP BRACKET
	19-733-07	CABLE RETAINER STRAP CABLE TIE
C3257	22-7876-18	0.33 µF 5% 250V POLY
C3261	22-7876-17	0.27 µF 5% 250V POLY
C3270	22-7811	1000pF 10% 1000V DISC
C3271	22-7811	1000pF 10% 1000V DISC
C3272	22-7811	1000pF 10% 1000V DISC
CX3299	22-7431-07	0.01 µF +80 % -20 % DISC
C3437	22-8050-24	0.10 µF 20% 50V POLYESTER (POLY)
C3438	22-8050-24	0.10 µF 20% 50V POLY
C3468	22-7860-15	3300 µF 20% 25V (ELECT)
C3469	22-7786-03	100pF 10% 500V DISC
C3470	22-8050-24	0.10 µF 20% 50V POLY
C3471	22-7786-10	470pF 10% 500V DISC
C3472	22-7811	1000pF 10% 1000V DISC
C3496	22-7999-01	10 µF +30% -10% 315V ELECT
DIODES		
CR2149	103-254-01	LOW VOLTAGE
CR2150	103-254-01	LOW VOLTAGE
	79-91	SLEEVING EXTRUDED NO 18 BLACK
CR2253	103-142-01	LOW VOLTAGE
CR2356	224-27	3.58MHz CRYSTAL QUARTZ
CR2701	103-142-01	LOW VOLTAGE
CR2702	103-142-01	LOW VOLTAGE
CRX3200	103-412	4.4V 3% 1/2W ZENER
CR3201	103-254-01	LOW VOLTAGE
CR3210	103-142-01	LOW VOLTAGE
CRX3214	103-254-01	LOW VOLTAGE
CRX3215	91-2053	22 GAUGE WIRE
CR3216	103-295-02	LOW VOLTAGE
CR3220	103-295-02	LOW VOLTAGE
CR3257	103-284	LOW VOLTAGE
CRX3271	103-315-06	LOW VOLTAGE
CRX3272	103-315-06	LOW VOLTAGE
CRX3273	103-315-06	LOW VOLTAGE
CRX3274	103-315-06	LOW VOLTAGE
CR3409	103-336-15	7.5V 0.5W ZENER
CR3467	103-309-01	10V 1/2W ZENER
CR3472	103-254-01	LOW VOLTAGE
CR3473	103-368-03	LOW VOLTAGE
CR3487	103-326	LOW VOLTAGE
SPARK GAP		
EX3201	38-102	HIGH VOLTAGE, 4KV DC
FUSE		
FX3299	136-113-23	NORMAL LAG 4 AMP 250V

CIRCUIT Comp. No.	ZENITH Part No.	DESCRIPTION
INTEGRATED CIRCUITS		
IC1201	221-190-01	INTEGRATED CIRCUIT
IC1451	A-9982-07	INTEGRATED CIRCUIT & HEAT SINK ASSEMBLY
IC2100	221-347	VERTICAL OUTPUT
	19-957-03	TRANSISTOR MOUNTING CLIP
	126-2337	HEAT SINK
IC2376	221-267	CHROMA/LUM & DEFLECTION PROCESSOR
ICX3202	223-18-01	HYBRID VOLTAGE REGULATOR
	12-8922-01	HEAT SINK BRACKET
	19-1106	TRANSISTOR RETAINING CLIP
	194-1367-02	TRANSISTOR RETAINING STRIP
	194-1367-07	TRANSISTOR INSULATING STRIP
PHONO JACK AND BRACKET ASSEMBLY		
J1201	A-9058-07	PHONO JACK AND BRACKET ASSEMBLY
COILS		
LX1201	20-4216-01	RCF PARASITIC SUPPRESSOR
L1203	20-3907	RCF 1.0 µH
L1204	20-3938-06	RCF
L1209	20-4172-11	RCF
L1210	20-4172-12	RCF
L1211	20-4029	RCF
L1226	20-3858-01	RCF
L1230	20-4172-06	RCF
L1231	20-3907-13	RCF 12 µH
L1232	20-4029	RCF
L1426	20-3800	RCF
L2276	20-4016	DELAY LINE
L2277	20-3887-13	RCF
L2288	20-3907-16	RCF 22 µH
L2376	95-3080-01	RCF CHROMA TRANSFORMER
LX2377	20-3907-12	RCF 10 µH
L2378	20-3887-20	RCF
LX3279	20-3907-12	RCF 10 µH
L3205	149-454	FERRITE BEAD CORE
L3210	149-454	FERRITE BEAD CORE
	91-2053	22 GAUGE WIRE
TRANSISTORS		
Q1229	121-499	NPN
Q1455	121-973	PNP
Q3200	121-966-03	NPN
QX3202	121-975	NPN HORIZONTAL PRE-DRIVER
Q3206	121-1037	NPN HORIZONTAL DRIVER
QX3208	121-1141	NPN
	12-8922-02	HEAT SINK BRACKET
	12-9349	LOCATOR
	19-1106	RETAINING CLIP
Q3209	121-975	NPN HORIZONTAL DRIVE-IN
Q3210	121-1146	NPN
Q3211	121-1146	NPN

CIRCUIT Comp. No.	ZENITH Part No.	DESCRIPTION

TRANSISTORS (Cont'd)

Q3213	121-1101	PNP START-UP MULTI VIBRATOR
Q3224	121-1101	PNP
Q3401	121-966-03	NPN
Q3403	121-499-01	NPN
Q3436	121-499-01	NPN
Q3437	121-966-03	NPN
	1266-2131-01	HEAT SINK

RESISTORS

R1201	63-10243-54	180 Ω 5% 1/2W TUB
R1203	63-11020-59	270 Ω 5% 1/2W TUB
R1204	63-11020-80	2.0K Ω 5% 1/4W TUB FILM
R1210	63-11020-97	10K Ω 5% 1/4W TUB FILM
R1211	63-11021-09	33K Ω 5% 1/4 TUB FILM
R1213	63-10857-12	ROTARY SINGLE CONTROL
R1214	63-11021-16	62KΩ 5% 1/4W TUB FILM
R1215	63-11020-81	2.2KΩ 5% 1/4W TUB FILM
R1217	63-11021-08	30K Ω 5% 1/4W TUB FILM
R1219	63-11020-73	1.OK Ω 5% 1/4W TUB FILM
R1221	63-11020-49	100 Ω 5% 1/4W TUB FILM
R1226	63-11020-61	330 Ω 5% 1/4W TUB FILM
R1227	63-11020-65	470 Ω 5% 1/4W TUB FILM
R1228	63-11021-13	47K Ω 5% 1/4W TUB FILM
R1230	63-10236-12	47K Ω 5% 1/4W TUB
R1231	63-10857-12	ROTARY SINGLE CONTROL
R1232	63-10235-56	220 Ω 5% 1/4W FILM
R1235	63-11021-13	47K Ω 5% 1/4W TUB FILM
R1236	63-11021-07	27K Ω 5% 1/4W TUB FILM
R1237	63-11020-72	910 Ω 5% 1/4W TUB FILM
R1240	63-11020-57	220 Ω 5% 1/4W TUB FILM
R1242	63-11020-57	220 Ω 5% 1/4W TUB FILM
R1243	63-11020-81	2.2K Ω 5% 1/4W TUB FILM
R1244	63-10857-12	SINGLE ROTARY CONTROL
R1246	63-11020-65	470 Ω 5% 1/4W TUB FILM
R1428	63-11020-17	4.7 Ω 5% 1/4W TUB FILM
R1430	63-11020-73	1.0K Ω 5% 1/4W TUB FILM
R1431	63-11020-65	470 Ω 5% 1/4W TUB FILM
R1451	63-10857-36	SINGLE ROTARY CONTROL
R1452	63-11020-77	1.5K Ω 5% 1/4W TUB FILM
R1453	63-11021-05	22K Ω 5% 1/4W TUB FILM
RX1454	63-10243	1 Ω 5% 1/2W FILM
R1455	63-102135-46	82 Ω 5% 1/4W FILM
RX1456	63-10565-12	3.3 Ω 5% 1/2W FILM
RX1457	63-10565-12	3.3 Ω 5% 1/2W FILM
R1459	63-11020-89	4.7 Ω 5% 1/4W TUB FILM
RX1460	63-10565-12	3.3 Ω 5% 1/2W FILM
R1461	63-11020-73	1.0K Ω 5% 1/4W TUB FILM
R1462	63-11021-25	150K Ω 5% 1/4W TUB FILM
R2105	63-11020-95	8.2K Ω 5% 1/4W TUB FILM
RX2106	63-10243	1 Ω 5% 1/2W FILM
R2109	63-11020-89	4.7K Ω 5% 1/4W TUB FILM
R2110	63-11020-65	470 Ω 5% 1/4W TUB FILM
R2111	63-11020-94	7.5K Ω 5% 1/4W TUB FILM
R2112	63-11020-97	10K Ω 5% 1/4W TUB FILM
RX2147	63-11020-07	1.8 Ω 5% 1/4W TUB FILM
R2148	63-11020-67	560 Ω 5% 1/4W TUB FILM
R2149	63-11020-67	560 Ω 5% 1/4W TUB FILM
R2170	63-11021-09	33K Ω 5% 1/4W TUB FILM
R2171	63-11020-77	1.5K Ω 5% 1/4W TUB FILM

CIRCUIT Comp. No.	ZENITH Part No.	DESCRIPTION

RESISTORS (Cont'd)

R2172	63-10857-08	SINGLE ROTARY CONTROL
R2174	63-11020-92	6.2K Ω 5% 1/4W TUB FILM
R2201	63-11020-85	3.3K Ω 5% 1/4W TUB FILM
R2203	63-11020-84	3.0K Ω 5% 1/4W TUB FILM
R2204	63-11020-73	1.0K Ω 5% 1/4W TUB FILM
R2251	63-11020-75	1.2K Ω 5% 1/4W TUB FILM
R2253	63-11020-97	10K Ω 5% 1/4W TUB FILM
R2254	63-11021-37	470K Ω 5% 1/4W TUB FILM
R2256	63-11020-73	1.0K Ω 5% 1/4W TUB FILM
R2257	63-10235-85	3.6K Ω 5% 1/4W FILM
R2260	63-11021-04	20K Ω 5% 1/4W TUB FILM
R2266	63-11020-65	470 Ω 5% 1/4W TUB FILM
R2276	63-11020-71	820 Ω 5% 1/4 TUB FILM
R2278	63-11020-79	1.8K Ω 5% 1/4W TUB FILM
R2350	63-11032-01	CONTROL GROUP 9 MM, GANG
R2351	63-11032	CONTROL GROUP 9 MM, GANG
R2354	63-11020-86	3.6K Ω 5% 1/4W TUB FILM
R2355	63-11020-71	820 Ω 5% 1/4W TUB FILM
R2356	63-11020-71	820 Ω 5% 1/4W TUB FILM
R2357	63-11020-90	5.1K Ω 5% 1/4W TUB FILM
R2358	63-11020-73	1.0K Ω 5% 1/4W TUB FILM
R2376	63-11020-79	1.8K Ω 1/4W TUB FILM
R2379	63-11020-66	510 Ω 5% 1/4W TUB FILM
R2381	63-10235-64	470 Ω 5% 1/4W FILM
R2383	63-11020-49	100 Ω 5% 1/4W TUB FILM
R2385	63-11020-81	2.2K Ω 5% 1/4W TUB FILM
R2387	63-11020-65	470 Ω 5% 1/4W TUB FILM
R2388	63-11021-46	1.1M Ω 5% 1/4W TUB FILM
R2390	63-10857-12	SINGLE ROTARY CONTROL
R2392	63-11020-67	560 Ω 5% 1/4W TUB FILM
R2393	63-11020-67	560 Ω 5% 1/4W TUB FILM
R2394	63-11020-67	560 Ω 5% 1/4W TUB FILM
R2506	63-11020-99	12K Ω 5% 1/4W TUB FILM
R2507	63-11020-99	12K Ω 5% 1/4W TUB FILM
R2508	63-11020-99	12K Ω 5% 1/4W TUB FILM
RX2704	63-10243-73	1.1K Ω 5% 1/2W FILM
R2711	63-10235-85	3.6K Ω 5% 1/4W FILM
R2713	63-10243-74	1.2K Ω 5% 1/2W FILM
R2714	63-10243-74	1.2K Ω 5% 1/2W FILM
R2715	63-10243-75	1.2K Ω 5% 1/2W FILM
R2716	63-10243-74	1.2K Ω 5% 1/2W FILM
R2731	63-11020-73	1.0K Ω 5% 1/4W TUB FILM
R2732	63-11020-81	2.2K Ω 5% 1/4W TUB FILM
R2733	63-11021-99	12K Ω 5% 1/4W TUB FILM
R2734	63-11021-14	51K Ω 5% 1/4W TUB FILM
R2735	63-11021-29	220K Ω 5% 1/4W TUB FILM
R2739	63-11021-04	20K Ω 5% 1/4W TUB FILM
R2745	63-10233-97	11K Ω 2% 1/4W FILM
R2746	63-11020-97	10K Ω 5% 1/4W TUB FILM
R2747	63-11020-49	100 Ω 5% 1/4W TUB FILM
RX3200	63-10442-58	27 Ω 5% 5 WATT WW
RX3201	63-10828-96	10K Ω 5% 1/2W FILM
R3202	63-11020-41	47 Ω 5% 1/4W TUB FILM
R3203	63-11021-37	470KΩ 5% 1/4W TUB FILM
RX3205	63-10482-75	130 Ω 5% 20W WW
	19-1085	CLIP MOUNTING
R3206	63-11021-14	51KΩ 5% 1/4W TUB FILM
R3207	63-11021-39	560KΩ 5% 1/4W TUB FILM
RX3208	63-11020-44	62 Ω 5% 1/4W TUB FILM
R3210	63-11021-25	150KΩ 1/4W TUB FILM

CIRCUIT Comp. No.	ZENITH Part No.	DESCRIPTION
RESISTORS (Cont"d)		
R3211	63-10236-40	680KΩ 5% 1/4W FILM
R3212	63-11021-23	120KΩ 5% 1/4W TUB FILM
R3213	63-10244-20	100KΩ 5% 1/2W FILM
RX3214	63-10233-84	3.3KΩ 2% 1/4W FILM
R3215	63-11021-37	470KΩ 5% 1/4W TUB FILM
R3216	63-10828-72	1KΩ 5% 1/2W FILM
RX3217	63-10832-79	2KΩ 5% 1W FILM
R3220	63-10243-70	820Ω 5% 1/2W FILM
RX3224	63-10828-28	15 Ω 5% 1/2W FILM
R3225	63-10442-86	390 Ω 5% 5W WW
RX3226	91-2053	22 GAUGE WIRE
R3229	63-11021-28	200KΩ 5% 1/4W TUB FILM
R3233	63-10243-68	680 Ω 5% 1/2W FILM
R3234	63-10235-86	3.9KΩ 5% 1/4W FILM
RX3237	63-10420-37	3.6 Ω 5% 2W WW
RX3248	63-10449-31	2 Ω 5% 7W WW
RX3249	63-10837-02	18K Ω 5% 2W FILM
	12-9341	BRACKET
R3257	63-10828-96	10KΩ 5% 1/2W FILM
RX3261	63-11037-01	18 Ω 10% 10W WW
	12-9341	BRACKET
R3263	63-10832-32	22 Ω 5% 1W FILM
R3267	63-10243-40	47 Ω 5% 1/2W FILM
RX3274	63-10657-03	1.2M Ω 20% 1/2W CARBON
	79-317-03	HEAT SHRINKABLE SLEEVING
RX3283	63-11020-66	510 Ω 5% 1/4W TUB FILM
RX3297	63-10710	THERMISTOR
RX3297	194-828-01	INSULATING STRIP
R3404	63-10233-69	RES FILM 750 Ω 2% 1/4W
R3406	63-10235-62	RES FILM 390 Ω 5% 1/4W
RX3408	63-10428-62	RES WW 39 Ω 5% 3W
R3461	63-11020-53	RES FILM TUB 150 Ω 5% 1/4W
R3462	63-11020-45	RES FILM TUB 68 Ω 5% 1/4W
R3463	63-10235-67	RES FILM 620 Ω 5% 1/4W
RX3464	63-10442-43	RES WW 6.2 Ω 5% 5W
R3466	63-11020-91	RES FILM TUB 5.6KΩ 5% 1/4W
R3467	63-10235-76	RES FILM 1.5K Ω 5% 1/4W
RX3468	63-10565-56	RES FILM 220 Ω 5% 1/2W
RX3470	63-10836-95	RES FILM 9.1KΩ 5% 2W
RX3477	63-10442-60	RES WW 33 Ω 5% 5W
RX3496	63-10836-94	RES FILM 8.2KΩ 5% 2W
R3503	63-11021-07	RES FILM TUB 27KΩ 5% 1/4W
R3504	63-11021-04	RES FILM TUB 20KΩ 5% 1/4W
R3513	63-11020-78	RES FILM TUB 1.6KΩ 5% 1/4W
TRANSFORMERS		
TX3204	95-3816-02	SWEEP
TX3205	95-3848-01	DRIVER
TX3298	95-3868-01	LINE CHOKE
TX3298	95-3868-02	LINE CHOKE
FILTERS		
U1201	224-26-01	CRYSTAL
U1230	224-23	CERAMIC TRAP
U1402	224-4	CERAMIC

CIRCUIT Comp. No.	ZENITH Part No.	DESCRIPTION
JUMPERS AND WIRES		
W1	91-2053	22 GAUGE
W2	91-2053	22 GAUGE
W3	63-11020	ZERO Ω 5% 1/4W TUB FILM
W5	91-2053	22 GAUGE
W6	91-2053	22 GAUGE
W7	91-2053	22 GAUGE
W8	63-11020	ZERO Ω 5% 1/4W TUB FILM
W9	91-2053	22 GAUGE
W10	91-2053	22 GAUGE
W11	91-2053	22 GAUGE
W12	63-11020	ZERO Ω 5% 1/4W TUB FILM
W13	91-2053	22 GAUGE
W14	63-11020	ZERO Ω 5% 1/4W TUB FILM
W15	91-2053	22 GAUGE
W16	63-11020	ZERO Ω 5% 1/4W TUB FILM
W17	63-11020	ZERO Ω 5% 1/4W TUB FILM
W18	63-11020	ZERO Ω 5% 1/4W TUB FILM
W19	91-2053	22 GAUGE
W20	63-11020	ZERO Ω 5% 1/4W TUB FILM
W21	91-2053	22 GAUGE
W22	91-2053	22 GAUGE
W23	63-11020	ZERO Ω 5% 1/4W TUB FILM
W24	91-2053	22 GAUGE
W25	91-2053	22 GAUGE
W26	91-2053	22 GAUGE
W28	63-11020	ZERO Ω 5% 1/4W TUB FILM
W29	63-11020	ZERO Ω 5% 1/4W TUB FILM
W30	91-2053	22 GAUGE
W32	91-2053	22 GAUGE
W33	91-2053	22 GAUGE
W34	91-2053	22 GAUGE
W35	63-11020	ZERO Ω 5% 1/4W TUB FILM
W36	63-11020	ZERO Ω 5% 1/4W TUB FILM
W39	91-2053	22 GAUGE
W40	91-2053	22 GAUGE
W41	91-2053	22 GAUGE
W42	63-11020	ZERO Ω 5% 1/4W TUB FILM
W43	91-2053	22 GAUGE
W44	91-2053	22 GAUGE
W45	91-2053	22 GAUGE
MISCELLANEOUS COMPONENTS		
	12-9116	BRACKET
	12-9260	SWEEP SUPPORT BRACKET
	19-838-06	STANDOFF CLIP
	19-838-07	CLIP STANDOFF, TWIST-LOK
	24-3112	TOP COVER
	64-519-01	ROLLED FLANGE EYELET (1 REQ)
	64-519-03	ROLLED FLANGE EYELET (5 REQ)
	64-1032	GRIPLET
	78-3058	2 CIRCUIT SHUNT CONNECTOR
	78-3298	CONNECTOR
	78-3302-02	CONNECTOR
	82-308	GROUND FORMED STRAP
	83-9331	TERM STRIP SOLDER
	86-799	TERMINAL PIN (69 REQ)
	86-848	WIRE GRIP TERMINAL (16 REQ)
	126-2428	OUTER SHIELD
	126-2429	BOTTOM SHIELD
	194-1720	INSULATING STRIP

VHF/UHF TUNER MODULE (175-2277)

CIRCUIT Comp. No.	ZENITH Part No.	DESCRIPTION
CAPACITORS		
C1	22-7988-41	22 pF 5% 50V CERAMIC (CER) TUBULAR (TUB)
C2	22-8029	36pF 500V DISC
C3	22-7985-22	5.6pF ±0.50pF 50V CER TUB
C4	22-7986-34	12pF 5% 50V CER TUB
C5	22-7984-11	470pF 10% 50V CER TUB
C6	22-7984-04	120pF 10% 50V CER TUB
C7	22-7984-11	470pF 10% 50V CER TUB
C8	22-7621-17	20pF 5% 50V DISC
C9	22-7988-42	24pF 5% 50V CER TUB
C9	22-7988-45	26pF 5% 50V CER TUB
C10	22-7992	10000pF 10% 16V CER TUB
C11	22-7985-19	4.7pF +/- 0.25pF CER TUB
C12	22-7984-11	470pF 10% 50V CER TUB
C13	22-7984-11	470pF 10% 50V CER TUB
C14	22-7984-11	470pF 10% 50V CER TUB
C15	22-7984-11	470pF 10% 50V CER TUB
C16	22-7985-13	3pF +/- 0.25pF CER TUB
C17	22-7984-11	470pF 10% 50V CER TUB
C20	22-7400-09	0.18pF 10% 500V GIMMICK
C20	22-7400-11	0.12pF 10% 500V GIMMICK
C21	22-7988-44	30pF 5% 50V CER TUB
C22	22-7988-41	22pF 5% 50V CER TUB
C23	22-7989-47	39pF 5% 50V CER TUB
C25	22-7986-06	1.5pF 20% 50V CER TUB
C27	22-7988-40	20pF 5% 50V CER TUB
C28	22-7985-12	2.7pF +/- 0.25pF 50V CER TUB
C29	22-7984-15	1000pF 10% 50V CER TUB
C30	22-7989-49	47pF 5% 50V CER TUB
C31	22-7984-11	470pF 10% 50V CER TUB
C33	22-7988-10	2.2pF 10% 50V CER TUB
C36	22-7991	2200pF 10% 16V CER TUB
C39	22-7985	0.5pF ±0.25pF 50V CER TUB
C40	22-7985-09	2pF ±0.25pF 50V CER TUB
C42	22-7991	2200pF 10% 16V CER TUB
C43	22-7991	2200pF 10% 16V CER TUB
C44	22-7988-44	30pF 5% 50V CER TUB
C44	22-7989-37	15pF 5% 50V CER TUB
C101	22-7984-15	1000pF 10% 50V CER TUB
C102	22-7985-23	6pF ±0.50pF 50V CER TUB
C103	22-7985-23	6pF ±0.50pF 50V CER TUB
C105	22-7985-17	4pF ±0.25pF 50V CER TUB
C106	22-7984-15	1000pF 10% 50V CER TUB
C107	22-7985-09	2pF ±0.25pF 50V CER TUB
C108	22-7920-58	120pF 5% 50V CER CHIP
C109	22-7984-15	1000pF 10% 50V CER TUB
C111	22-7984-15	1000pF 10% 50V CER TUB
C112	22-7986-40	20pF 5% 50V CER TUB
C113	22-7984-15	1000pF 10% 50V CER TUB
C114	22-7984-15	1000pF 10% 50V CER TUB
C116	22-7984-15	1000pF 10% 50V CER TUB
C117	22-7984-15	1000pF 10% 50V CER TUB
C118	22-7984-15	1000pF 10% 50V CER TUB
C119	22-7984-15	1000pF 10% 50V CER TUB

CIRCUIT Comp. No.	ZENITH Part No.	DESCRIPTION
CAPACITORS (Cont'd)		
C121	22-7985-13	3pF ±0.25pF 50V CER TUB
C122	22-7989-49	47pF 5% 50V CER TUB
C123	22-7984-15	1000pF 10% 50V CER TUB
C124	22-7984-15	1000pF 10% 50V CER TUB
C126	22-7985-13	3pF ±0.25pF 50V CER TUB
C127	22-7984-04	120pF 10% 50V CER TUB
C128	22-7989-49	47pF 5% 50V CER TUB
C129	22-7984-15	1000pF 10% 50V CER TUB
C130	22-7984-15	1000pF 10% 50V CER TUB
C131	22-7988-12	2.7pF 10% 50V CER TUB
C132	22-7985-06	1.5pF ±0.25pF 50V CER TUB
C133	22-7986-29	8.2pF 10% 50V CER TUB
C135	22-7984-15	1000pF 10% 50V CER TUB
C136	22-7989-51	62pF 5% 50V CER TUB
C137	22-7984-15	1000pF 10% 50V CER TUB
C138	22-7991	2200pF 10% 16V CER TUB
C139	22-7985-17	4pF ±0.25pF 50V CER TUB
C141	22-7986-02	1pF 202% 50V CER TUB
C142	22-7984-15	1000pF 10% 50V CER TUB
C143	22-7984-15	1000pF 10% 50V CER TUB
C144	22-7985-23	6pF ±0.50pF 50V CER TUB
C146	22-7985-23	6pF ±0.50pF 50V CER TUB
C147	22-7984-15	1000pF 10% 50V CER TUB
C148	22-7989-49	47pF 5% 50V CER TUB
C251	22-7984-15	1000pF 10% 50V CER TUB
C252	22-7984-15	1000pF 10% 50V CER TUB
C253	22-7984-15	1000pF 10% 50V CER TUB
C254	22-7984-15	1000pF 10% 50V CER TUB
C255	22-7984-15	1000pF 10% 50V CER TUB
C256	22-7984-15	1000pF 10% 50V CER TUB
C257	22-7984-15	1000pF 10% 50V CER TUB
C259	22-7991	2200pF 10% 16V CER TUB
C6600	22-8023-06	1.0 µF 20% 50V (ELECT)
C6601	22-7563-28	0.22 µF 10% 100V POLYESTER (POLY)
C6602	22-7992	10000pF 10% 16V CER TUB
C6604	22-7613-20	4700pF 10% 50V DISC
C6605	22-8003	.047 µF 5% 50V CER CHIP
C6606	22-8049-24	0.10 µF 10% 50V POLY
C6607	22-8020-12	10 µF 20% 16V ELECT
C6609	22-8049-12	0.10 µF 10% 50V POLY
C6610	22-8020-09	3.3 µF 20% 16V ELECT
C6611	22-8020-16	47 µF 20% 16V ELECT
C6612	22-8003-02	.1 µF 5% 50V CER CHIP
C6614	22-8049-24	0.10 µF 10% 50V POLY
C6625	22-7992	10000pF 10% 16V CER TUB
C6700	22-8003	.047 µF 5% 50V CER CHIP
C6701	22-7986-32	10pF 5% 50V CER TUB
C6702	22-7986-32	10pF 5% 50V CER TUB
C6703	22-8049-24	0.10 µF 10% 50V POLY
C6704	22-7992	10000pF 10% 16V CER TUB
C6705	22-8020-10	4.7 µF 20% 16V ELECT
C6706	22-8020-06	1.0 µF 20% 16V ELECT
C6707	22-7992	10000pF 10% 16V CER TUB

CIRCUIT Comp. No.	ZENITH Part No.	DESCRIPTION
CAPACITORS (Cont'd)		
C6708	22-7988-44	30pF 5% 50V CER TUB
C6708	22-7989-32	10pF 5% 50V CER TUB
C6709	22-7984015	1000pF 10% 50V CER TUB
C6710	22-7984-15	1000pF 10% 50V CER TUB
C6711	22-7984-15	1000pF 10% 50V CER TUB
C6712	22-7984-15	1000pF 10% 50V CER TUB
C6713	22-7984-15	1000pF 10% 50V CER TUB
C6714	22-7984-15	1000pF 10% 50V CER TUB
C6715	22-7984-15	1000pF 10% 50V CER TUB
C6720	22-7984-15	1000pF 10% 50V CER TUB
C6721	22-7984-15	1000pF 10% 50V CER TUB
C6722	22-7984-15	1000pF 10% 50V CER TUB
C6724	22-7858-11	330 µF 20% 10V ELECT
C6725	22-7984-15	1000pF 10% 50V CER TUB
C6726	22-7991	2200pF 20% 16V CER TUB
C6727	22-8020-06	1.0 µF 20% 16V ELECT
C6728	22-8049-24	0.10 µF 10% 50V POLY
C6729	22-8049-12	0.010 µF 10% 50V POLY
C6730	22-8020-10	4.7 µF 20% 16V ELECT
DIODES - CRYSTALS - FILTERS		
CR1	103-393	HIGH FREQUENCY
CR2	103-393	HIGH FREQUENCY
CR3	103-387	VARIABLE CAPACITANCE
CR4	103-387	VARIABLE CAPACITANCE
CR5	103-387	VARIABLE CAPACITANCE
CR6	103-387	VARIABLE CAPACITANCE
CR7	103-372	HIGH FREQUENCY
CR7	103-381	HIGH FREQUENCY
CR101	103-393	HIGH FREQUENCY
CR102	103-393	HIGH FREQUENCY
CR103	103-389	VARIABLE CAPACITANCE
CR104	103-389	VARIABLE CAPACITANCE
CR105	103-393	HIGH FREQUENCY
CR106	103-393	HIGH FREQUENCY
CR107	103-393	HIGH FREQUENCY
CR108	103-393	HIGH FREQUENCY
CR109	103-389	VARIABLE CAPACITANCE
CR110	103-393	HIGH FREQUENCY
CR111	103-178-02	SWITCHING
CR112	103-389	VARIABLE CAPACITANCE
CR113	103-392	HIGH FREQUENCY
CR114	103-392	HIGH FREQUENCY
CR6600	103-398	LOW VOLTAGE
CR6700	224-32-01	CRYSTAL QUARTZ
HPF1	105-185-01	LC NETWORK HIGH PASS FILTER
INTEGRATED CIRCUITS		
IC1	221-241	PRESCALER
IC6600	221-419	TUNING SYSTEM INTERFACE
IC6700	221-418	MOS INTEGRATED CIRCUIT
JUMPERS		
J1	63-10979	ZERO Ω 5% 1/8W FILM
J2	63-10979	ZERO Ω 5% 1/8W FILM
J3	63-10979	ZERO Ω 5% 1/8W FILM
J4	63-10979	ZERO Ω 5% 1/8W FILM

CIRCUIT Comp. No.	ZENITH Part No.	DESCRIPTION
JUMPERS (Cont'd)		
J5	63-10979	ZERO Ω 5% 1/8W FILM
J6	63-10979	ZERO Ω 5% 1/8W FILM
J8	63-10979	ZERO Ω 5% 1/8W FILM
J13	63-10979	ZER0 Ω 5% 1/8W FILM
J15	63-10979	ZERO Ω 5% 1/8W FILM
J16	63-10979	ZERO Ω 5% 1/8W FILM
J17	63-10979	ZERO Ω 5% 1/8W FILM
J18	63-10979	ZERO Ω 5% 1/8W FILM
J102	63-10979	ZERO Ω 5% 1/8W FILM
J103	63-10979	ZERO Ω 5% 1/8W FILM
J104	63-10979	ZERO Ω 5% 1/8W FILM
J252	63-10979	ZERO Ω 5% 1/8W FILM
J253	63-10979	ZERO Ω 5% 1/8W FILM
J254	63-10979	ZERO Ω 5% 1/8W FILM
J256	63-10979	ZERO Ω 5% 1/8W FILM
J257	63-10979	ZERO Ω 5% 1/8W FILM
J259	63-10979	ZERO Ω 5% 1/8W FILM
J260	63-10979	ZERO Ω 5% 1/8W FILM
J6601	63-10979	ZERO Ω 5% 1/8W FILM
J6605	63-10979	ZERO Ω 5% 1/8W FILM
J6607	63-10979	ZERO Ω 5% 1/8W FILM
J6701	63-10979	ZERO Ω 5% 1/8W FILM
J6716	63-10979	ZERO Ω 5% 1/8W FILM
J6722	63-10979	ZERO Ω 5% 1/8W FILM
J6725	63-10979	ZERO Ω 5% 1/8W FILM
J6727	63-10979	ZERO Ω 5% 1/8W FILM
COILS		
L1	20-3768-02	RCF LOW CHANNEL ANTENNA SHUNT
L2	20-3768-02	RCF LOW CHANNEL ANTENNA SHUNT
L3	20-4111-01	RCF IF FILTER
L4	20-4226	INDUCTIVE TRIMMER
	79-317-04	SLEEVING HEAT SHRINKABLE
L5	91-2053	22 GAUGE WIRE
L6	20-4174	GATE LINE
L7	20-4178-01	RCF GATE BOOST
L8	20-4179-01	RCF DRAIN BOOST
L9	20-4226	INDUCTIVE TRIMMER
	79-317-04	SLEEVING HEAT SHRINKABLE
L11	20-4225	DRAIN LINE
L12	20-4217	MIXER LINE
L13	20-4218	INDUCTIVE TRIMMER
	79-317-04	SLLEVING HEAT SHRINKABLE
L14	20-4180-01	RCF IF INPUT
L16	20-4181-01	RCF MIXER IF
L17	20-4187-02	RCF IF OUT
L18	20-4188	STAMPED METAL
L19	20-4218	INDUCTIVE TRIMMER
	79-317-04	SLEEVING HEAT SHRINKABLE
L21	149-417	FERRITE CORE SLEEVE
L22	20-4198-01	RCF OSCILLATOR
L23	20-4221	CHOKE
L24	20-4221	CHOKE
L26	20-3819-02	RCF
L28	20-3907-12	RCF 10 µH
L100	20-4129-13	RCF
L101	20-3768-02	RCF LOW CHANNEL ANTENNA SHUNT

CIRCUIT Comp. No.	ZENITH Part No.	DESCRIPTION
COILS (Cont'd)		
L102	20-3841-02	RCF
L103	20-3678-02	RCF FM PARALLEL RESONANT
L104	20-4186-01	RCF LOW CHANNEL ANTENNA
L106	20-4185-01	RCF HIGH CHANNEL ANTENNA
L107	20-3678-02	RCF FM PARALLEL RESONANT
L108	149-418	FERRITE CORE SLEEVE
L109	20-3907-06	RCF 3.3 µH
L110	20-4129-20	RCF
L111	20-3740-02	RCF HIGH CHANNEL ANTENNA
L112	20-4167-01	RCF LO CHANNEL RF
L113	20-4168-01	RCF LO CHANNEL OSC
L114	20-4023-01	RCF
L116	20-4024-01	RCF
L117	20-4077-01	RCF
L118	20-4166-01	RCF
L119	20-3678-02	RCF FM PARALLEL RESONANT
L122	20-4077-01	RCF
L123	20-4205-01	RCF HI CHANNEL OSC
L124	20-4190-01	RCF LO CHANNEL OSC
L125	20-4206-01	RCF HI CHANNEL OSC
L126	20-3907-12	RCF 10 µH
L127	20-4169-01	RCF
L128	20-4151	RCF TUNABLE
L6600	20-3907-12	RCF 10 µH
L6601	20-3907-12	RCF 10 µH
TRANSISTORS		
Q1	121-1126	FET
Q2	121-1128	NPN
Q3	121-1089	FET
Q4	121-1125	NPN
Q5	121-1125-01	NPN
Q6	121-1127-01	PNP
Q6600	121-1133	PNP CHIP
Q6601	121-1133	PNP CHIP
Q6700	121-1133	PNP CHIP
Q6701	121-1133	PNP CHIP
Q6704	121-1133	PNP CHIP
Q6707	121-1133	PNP CHIP
Q6710	121-1130	NPN CHIP
Q6711	121-1133	PNP CHIP
RESISTORS		
RX1	63-10657-05	1.0M Ω 20% 1/2W CARBON
R2	63-10979-57	2.7KΩ 5% 1/8W FILM
R3	63-10979-57	2.7KΩ 5% 1/8W FILM
R4	63-10979-83	39KΩ 5% 1/8W FILM
R6	63-10979-57	2.7KΩ 5% 1/8W FILM
R7	63-10979-47	1.0KΩ 5% 1/8W FILM
R8	63-10979-32	220 Ω 5% 1/8W FILM
R9	63-10979076	18KΩ 5% 1/8W FILM
R10	63-10979074	15KΩ 5% 1/8W FILM
R11	63-10979-70	10KΩ 5% 1/8W FILM
R12	63-10979-47	1.0KΩ 5% 1/8W FILM
R13	63-10979-62	4.7 KΩ 5% 1/8W FILM
R14	63-10979-78	22KΩ 5% 1/8W FILM
R15	63-10979-74	15KΩ 5% 1/8W FILM

CIRCUIT Comp. No.	ZENITH Part No.	DESCRIPTION
RESISTORS (Cont'd)		
R16	63-10979-58	3.0KΩ 5% 1/8W FILM
R17	63-10979-54	2.0KΩ 5% 1/8W FILM
R18	63-10979-21	75 Ω 5% 1/8W FILM
R19	63-10979-70	10KΩ 5% 1/8W FILM
R20	63-10979-47	1.0KΩ 5% 1/8W FILM
R21	63-10979-58	3.0KΩ 5% 1/8W FILM
R22	63-10979-40	510 Ω 5% 1/8W FILM
R23	63-10979-18	56 Ω 5% 1/8W FILM
R24	63-10979-64	5.6KΩ 5% 1/8W THICK FILM CHIP
R25	63-10979-13	33 Ω 5% 1/8W FILM
R27	63-10979-70	10KΩ 5% 1/8W FILM
R28	63-10979-03	20KΩ 5% 1/4W FILM
R29	63-10979-40	510 Ω 5% 1/8W FILM
R100	63-10979-47	1.0KΩ 5% 1/8W FILM
R101	63-10979-57	2.7KΩ 5% 1/8W FILM
R102	63-10979-57	2.7KΩ 5% 1/8W FILM
R103	63-10979-49	1.2KΩ 5% 1/8W FILM
R104	63-10979-83	39KΩ 5% 1/8W FILM
R105	63-10979-87	56KΩ 5% 1/8W FILM
R106	63-10979-93	100KΩ 5% 1/8W FILM
R107	63-10979-93	100KΩ 5% 1/8W FILM
R108	63-10979-51	1.5KΩ 5% 1/8W FILM
R109	63-10979-34	270 Ω 5% 1/8W FILM
R110	63-10979-47	10KΩ 5% 1/8W FILM
R111	63-10979-01	10 Ω 5% 1/8W FILM
R112	63-10979-49	1.2KΩ 5% 1/8W FILM
R113	63-10979-49	1.2KΩ 5% 1/8W FILM
R114	63-10979-78	22KΩ 5% 1/8W FILM
R115	63-10979-82	2.7KΩ 5% 1/8W FILM
R116	63-10979-78	22KΩ 5% 1/8W FILM
R117	63-10979-49	1.2KΩ 5% 1/8W FILM
R118	63-10979-49	1.2KΩ 5% 1/8W FILM
R119	63-10979-78	22KΩ 5% 1/8W FILM
R120	63-10979-24	100 Ω 5% 1/8W FILM
R121	63-10979-64	5.6KΩ 5% 1/8W FILM
R122	63-10979-51	1.5KΩ 5% 1/8W FILM
R123	63-10979-53	1.8KΩ 5% 1/8W FILM
R124	63-10979-49	1.2KΩ 5% 1/8W FILM
R125	63-10979-24	100 Ω 5% 1/8W FILM
R126	63-10979-49	1.2KΩ 5% 1/8W FILM
R127	63-10979-64	56KΩ 5% 1/8W FILM
R128	63-10979-49	1.2KΩ 5% 1/8W FILM
R129	63-10979-54	2.0KΩ 5% 1/8W FILM
R130	63-10979-24	100 Ω 5% 1/8W FILM
R131	63-10979-57	2.7KΩ 5% 1/8W FILM
R132	63-10979-49	1.2KΩ 5% 1/8W FILM
R133	63-10979-72	12KΩ 5% 1/8W FILM
R134	63-10979-83	39KΩ 5% 1/8W FILM
R136	63-10979-18	56 Ω 5% 1/8W FILM
R137	63-10979-59	3.3KΩ 5% 1/8W FILM
R138	63-10979-60	3.9KΩ 5% 1/8W FILM
R139	63-10979-61	4.3KΩ 5% 1/8W FILM
R141	63-10979-54	2.0KΩ 5% 1/8W FILM
R142	63-10979-32	220 Ω 5% 1/8W FILM
R143	63-10979-39	470 Ω 5% 1/8W FILM
R144	63-10979-70	10KΩ 5% 1/8W FILM
R146	63-10979-64	5.6KΩ 5% 1/8W FILM
R6600	63-10979-77	20KΩ 5% 1/8W FILM
R6601	63-10979-93	100KΩ 5% 1/8W FILM

RESISTORS (Cont'd)

CIRCUIT Comp. No.	ZENITH Part No.	DESCRIPTION
R6602	63-10979-68	8.2KΩ 5% 1/8W FILM
R6603	63-10979-70	10KΩ 5% 1/8W FILM
R6604	63-10979-62	390 Ω 5% 1/8W FILM
R6606	63-10979-16	47 Ω 5% 1/8W FILM
R6608	63-10979-74	15KΩ 5% 1/8W FILM
R6609	63-10979-93	100KΩ 5% 1/8W FILM
R6610	63-10979-74	15KΩ 5% 1/8W FILM
R6611	63-10979-62	4.7KΩ 5% 1/8W FILM
R6612	63-10979-93	100KΩ 5% 1/8W FILM
R6612	63-10979-13	33 Ω 5% 1/8W FILM
R6613	63-10979	ZERO Ω 5% 1/8W FILM
R6614	63-10979	ZERO Ω 5% 1/8W FILM
R6616	63-10979	ZERO Ω 5% 1/8W FILM
R6617	63-10979-45	820 Ω 5% 1/8W FILM
R6618	63-10979-81	30KΩ 5% 1/8W FILM
R6619	63-10979-43	680 Ω 5% 1/8W FILM
R6620	63-10979-74	15KΩ 5% 1/8W FILM
R6700	63-10979	ZERO Ω 5% 1/8W FILM
R6702	63-10979-70	10KΩ 5% 1/8W FILM
R6703	63-10980-06	390KΩ 5% 1/8W TUB FILM
R6704	63-10979-93	100KΩ 5% 1/8W FILM
R6705	63-10979-85	47KΩ 5% 1/8W FILM
R6706	63-10979-78	22KΩ 5% 1/8W FILM
R6707	63-10979-62	4.7KΩ 5% 1/8W FILM
R6707	63-10979-82	33KΩ 5% 1/8W FILM
R6708	63-10979-62	4.7KΩ 5% 1/8W FILM
R6709	63-10979-66	6.8KΩ 5% 1/8W FILM
R6710	63-10979-55	2.2KΩ 5% 1/8W FILM
R6711	63-10979-70	10KΩ 5% 1/8W FILM
R6712	63-10979-24	100 Ω 5% 1/8W FILM
R6713	63-10979-65	6.2KΩ 5% 1/8W FILM
R6717	63-10979-39	470 Ω 5% 1/8W FILM
R6718	63-10979-62	4.7KΩ 5% 1/8W FILM
R6719	63-10979-46	910 Ω 5% 1/8W FILM
R6723	63-10979-51	1.5KΩ 5% 1/8W FILM
R6726	63-10979-51	1.5KΩ 5% 1/8W FILM
R6729	63-10979-66	6.8KΩ 5% 1/8W FILM
R6730	63-10979-05	330KΩ 5% 1/8W TUB FILM
R6731	63-10979-24	100Ω 5% 1/8W FILM
R6732	63-10979-74	15KΩ 5% 1/8W FILM
R6733	63-10979-97	150KΩ 5% 1/8W FILM
R6734	63-10979-08	470KΩ 5% 1/8W TUB FILM
R6735	63-10979-97	150KΩ 5% 1/8W FILM
R6736	63-10979-70	10KΩ 5% 1/8W FILM
R6740	63-10979-51	1.5KΩ 5% 1/8W FILM
R6741	63-10979-51	1.5KΩ 5% 1/8W FILM
R6742	63-10979-51	1.5KΩ 5% 1/8W FILM

WIRE

CIRCUIT Comp. No.	ZENITH Part No.	DESCRIPTION
TP19	91-2053	22 GAUGE
W1	191-1005-03	22 GAUGE PRECUT
W3	191-1005-03	22 GAUGE PRECUT
W4	191-1005-03	22 GAUGE PRECUT
W5	191-1005-03	22 GAUGE PRECUT
W6	191-1005-03	22 GAUGE PRECUT
W7	191-1005-03	22 GAUGE PRECUT
W8	191-1005-03	22 GAUGE PRECUT
W9	191-1005-03	22 GAUGE PRECUT
W10	191-1005-03	22 GAUGE PRECUT
W11	191-1005-03	22 GAUGE PRECUT
W12	191-1005-03	22 GAUGE PRECUT
W13	191-1005-03	22 GAUGE PRECUT
W15	191-1005-03	22 GAUGE PRECUT
W19	191-1005-03	22 GAUGE PRECUT
W20	191-1005-03	22 GAUGE PRECUT
W21	191-1005-03	22 GAUGE PRECUT
W23	191-1005-03	22 GAUGE PRECUT
W24	191-1005-03	22 GAUGE PRECUT
W25	191-1005-03	22 GAUGE PRECUT
W26	191-1005-03	22 GAUGE PRECUT
W30	191-1005-03	22 GAUGE PRECUT
W103	191-1005-03	22 GAUGE PRECUT
W104	191-1005-03	22 GAUGE PRECUT
	79-91	SLEEVING EXTRUDED NO 18 BLACK
W105	191-1005-03	22 GAUGE PRECUT
	79-91	SLEEVING EXTRUDED NO 18 BLACK

MISCELLANEOUS COMPONENTS

12-8943	FRONT PLATE
12-8944	REAR PLATE
12-8945	RIGHT SIDE PLATE
12-8946	LEFT SIDE PLATE
19-1056	CLIP
24-3087	OUTER BOTTOM COVER
24-3088	OUTER TOP COVER
78-3230	JACK SINGLE
78-3230-01	JACK SINGLE
78-3231	JACK SINGLE
86-799	TERM PIN (34 REQ)
126-2366	SHIELD INNER TOP COVER
126-2367	SHIELD INNER BOTTOM COVER
126-2368	SHIELD INNER WALL
126-2369	SHIELD INNER WALL
126-2370	SHIELD INNER WALL
126-2371	SHIELD INNER WALL
126-2372	SHIELD DOUBLE WALL

VIDEO OUTPUT MODULE (9-465)

CIRCUIT Comp. No.	ZENITH Part No.	DESCRIPTION
CAPACITORS		
C5100	22-7811-06	10000pF 20% 1000V DISC
C5101	22-8049-24	0.10 µF 10% 50V POLYESTER (POLY)
C5103	22-7742-07	560pF 10% 50V TUBULAR (TUB)
C5104	22-7742-07	560pF 10% 50V TUB
C5105	22-7742-06	560pF 10% 50V TUB
C5109	22-7811-06	1000pF 20% 1000V DISC
C5110	22-7523-01	0.01 µF +20 % -20% 2000V DISC
SPARK GAPS		
E5100	52-2240-06	SPARK GAP
E5101	52-2240-06	SPARK GAP
E5102	52-2240-06	SPARK GAP
COIL & TRANSISTORS		
L5100	20-3887-26	RCF
Q5100	121-895	NPN
Q5101	121-895	NPN
Q5102	121-895	NPN
Q5103	121-1140	NPN
Q5104	121-1140	NPN
Q5105	121-1140	NPN
RESISTORS		
R5100	63-10233-89	5.1KΩ 2% 1/4W FILM
R5101	63-10233-89	5.1KΩ 2% 1/4W FILM
R5102	63-10233-89	5.1KΩ 2% 1/4W FILM
R5103	63-10233-62	390 Ω 2% 1/4W FILM
R5104	63-10233-61	360 Ω 2% 1/4W FILM
R5105	63-10233-62	390 Ω 2% 1/4W FILM
R5109	63-10233-68	680 Ω 2% 1/4W FILM
R5110	63-10233-67	620 Ω 2% 1/4W FILM
R5111	63-10233-68	680 Ω 2% 1/4W FILM
R5112	63-10854-18	SINGLE ROTARY CONTROL
R5113	63-10854-17	SINGLE ROTARY CONTROL
R5114	63-10854-19	SINGLE ROTARY CONTROL
R5115	63-10242-24	150KΩ 2% 1/2W FILM
R5116	63-10242-24	150KΩ 2% 1/2W FILM
R5117	63-10242-24	150KΩ 2% 1/2W FILM

CIRCUIT Comp. No.	ZENITH Part No.	DESCRIPTION
RESISTORS (Cont'd)		
R5118	63-10243-93	7.5KΩ 5% 1/2W FILM
R5119	63-10243-93	7.5KΩ 5% 1/2W FILM
R5120	63-10243-93	7.5KΩ 5% 1/2W FILM
R5121	63-10243-93	7.5KΩ 5% 1/2W FILM
R5122	63-10243-93	7.5KΩ 5% 1/2W FILM
R5123	63-10243-93	7.5KΩ 2% 1/2W FILM
R5124	63-7799	2.2KΩ 10% 1/2W CARBON
R5125	63-7799	2.2KΩ 10% 1/2W CARBON
R5126	63-7799	2.2KΩ 10% 1/2W CARBON
R5136	63-7785	1KΩ 10% 1/2W CARBON
R5137	63-10236-28	220KΩ 5% 1/4W FILM
R5138	63-10236-34	390KΩ 5% 1/4W FILM
R5139	63-10236-42	820KΩ 5% 1/4W FILM
R5140	63-7799	2.2KΩ 10% 1/2W CARBON
R5141	63-10235-60	330 Ω 5% 1/4W FILM
WIRE		
W1	91-2053	22 GAUGE
W2	91-2053	22 GAUGE
W3	91-2053	22 GAUGE
W4	91-2053	22 GAUGE
W5	91-2053	22 GAUGE
W6	91-2053	22 GAUGE
W7	91-2053	22 GAUGE
W8	91-2053	22 GAUGE
W9	91-2053	22 GAUGE
W10	91-2053	22 GAUGE
MISCELLANEOUS COMPONENTS		
	A-11056-08	CRT SOCKET ASSEMBLY W/CONNECTOR
	A-11056-17	CRT SOCKET ASSEMBLY W/CONNECTOR
	43-1821-02	FOCUS CONNECTOR
	64-1032	GRIPLET
	78-3057	4 POSITION SHUNT CONNECTOR
	86-687-01	TERMINAL INSERT, CYLINDRICAL, FEMALE
	86-733-02	TERMINAL USED ON GRAY WIRE
	86-799	TERMINAL PIN (13 REQ)
	86-966	TERM FEMALE WIRE MOUNTED

DC/AC CONVERTER MODULE (9-464)

CIRCUIT Comp. No.	ZENITH Part No.	DESCRIPTION
CAPACITORS		
C1	22-7859-16	4700 µF 20% 16V ELECTROLYTIC (ELECT)
C4	22-7672-26	.0082 µF 5% 1600V POLYPROPYLENE
	86-848	PC WIRE GRIP TERMINAL
C5	22-7909	47 µF +50% AND -10% 200V ELECT
C6	22-8043	2.2 µF 10% 630V POLYESTER (POLY)
	86-848	PC WIRE GRIP TERMINAL
C7	22-7858-09	100 µF 20% 10V ELECT
C8	22-7860-09	100 µF 20% 25V ELECT
C9	22-7962-07	2.2 µF 20% 200V ELECT
	86-848	PC WIRE GRIP TERMINAL
C10	22-7860-12	470 µF 20% 25V ELECT
	86-848	PC WIRE GRIP TERMINAL
C11	22-7864-02	2.2 µF 20% 100V ELECT
C13	22-7774-07	0.0039 µF 10% 100V POLY
C14	22-7786	1000pF 10% 500V DISC
C15	22-7811	1000pF 10% 1000V DISC
C16	22-7811-08	100pF 20% 1000V DISC
C17	22-7811-03	220pF 20% 1000V DISC
C18	22-7786	1000pF 10% 500V DISC
C19	22-7786	1000pF 10% 500V DISC
DIODES		
CR1	103-326	LOW VOLTAGE
CR2	103-298-05	LOW VOLTAGE
CR3	103-298-05	LOW VOLTAGE
CR4	103-254-01	LOW VOLTAGE
CR5	103-254-01	LOW VOLTAGE
CR6	103-279-22	13V 0.5W ZENER
CR7	103-315-04	LOW VOLTAGE
CR8	103-254-01	LOW VOLTAGE
CR9	103-298-05	LOW VOLTAGE
CR10	103-326	LOW VOLTAGE
CR11	103-326	LOW VOLTAGE
FUSES		
FX1	136-113-26	NORMAL LAG 6 AMP 250V
	19-840-02	HOLDER CLIP
RELAY		
KX1	195-119-04	RELAY
COILS		
L1	149-454	FERRITE BEAD CORE
L2	149-454	FERRITE BEAD CORE

CIRCUIT Comp. No.	ZENITH Part No.	DESCRIPTION
TRANSISTORS		
Q1	121-1160	NPN
	19-1076	MOUNTING CLIP
	194-1367-03	INSULATING STRIP
Q2	121-973	PNP
Q3	185-16	THYRISTOR SCR
RESISTORS		
R1	63-10420-26	1.2 Ω 5% 2W WW
	86-848	PC WIRE GRIP TERMINAL
R3	63-10837-14	56KΩ 5% 2W FILM
	86-848	PC WIRE GRIP TERMINAL
R4	63-10236032	330KΩ 5% 1/4W FILM
R5	63-10235-72	1KΩ 5% 1/4W FILM
R6	63-10235-69	330 Ω 5% 1/4W FILM
R7	63-10235-84	3.3KΩ 5% 1/4W FILM
R8	63-10244-12	47KΩ 5% 1/2W FILM
R9	63-10235-72	1KΩ 5% 1/4W FILM
TRANSISTOR		
T1	95-3827-01	INVERTER
WIRES		
W1	91-2053	22 GAUGE
W4	91-2053	22 GAUGE
MISCELLANEOUS COMPONENTS		
	A-14591	POWER PLUG AND CABLE ASSEMBLY
	43-1785	3 CIRCUIT HOUSING CONNECTOR
3R8	50-278-03	CABLE AND CONNECTOR ASSEMBLY
3Y7	50-M2S-00134	CABLE AND CONNECTOR HOUSING
	58-487	DUAL SWITCHING CONNECTOR
	64-519-03	ROLLED FLANGE EYELET
	86-783	CRIMP TYPE TERMINAL (1 REQ)
	86-799	TERM PIN (13 REQ)
	112-793-01	6-20 x 0.375" SCREW
	114-803	6-20 x 1/4" x 1/4" HEX-WASHER HEAD SCREW
	149-535	FERRITE CORE
	194-420	INSULATOR INSERT
	194-1715	INSULATING STRIP
BR1	12-8919	METAL STAMP BRACKET MOUNTING CONVERTER